Dr. Dobb's Journal

SOFTWARE TOOLS FOR ADVANCED PROGRAMMERS

#110 DECEMBER 1985 $2.95 (3.95 CANADA)

Behind Windows

GEM, TopView and Windows as Programming Environments

Operating System Extensions for CP/M-68K, ProDOS, CP/M

Converting to DOS 3.0

H.E.L.P. Eliminates Every Bug known to Compilers . . . As well as a few other species

H.E.L.P. is a completely interactive C programming environment with three innovative full-sized features that will revolutionize the way you write code.

A Clean Compile — Guaranteed!

Say Good-bye to all compiler-type errors. **H.E.L.P.** 's built-in program checker (which would embarrass LINT) not only hunts down bugs . . . explains the proper syntax . . . gives examples of usage . . . but will even offer suggested corrections. If you want, **H.E.L.P.** will even make the corrections for you . . . at the touch of a key.

H.E.L.P. also finds semantic errors as well as poor style and inefficiencies. You can even check the portability of your code!

Multi-Window Editing

Open as many windows as you want . . . . there's no limitation . . . not even your own memory. Because **H.E.L.P.** uses a virtual memory system you can create programs larger than your machine capacity.

H.E.L.P.'s very powerful editor allows you the flexibility to work in several windows . . . with several files at the same time.

Circle **no. 165** on reader service card

Save Keystrokes

Hundreds of commands are bound to the keyboard to give you fast execution.

Always be in Control

Not only can you develop code in many windows at the same time, but you can show (and refer to) important definitions in one window while creating in another. Or open a window and keep notes about your program . . . or type a memo . . . or a letter.

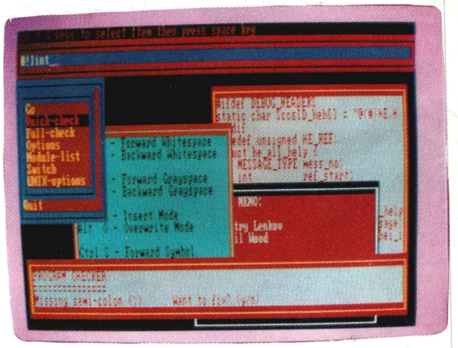
Increase your Productivity by 300% or More . . . . .

If you are a novice programmer, you'll begin writing code like an advanced programmer much faster with **H.E.L.P.**

Just imagine what **H.E.L.P.** will do for the ADVANCED PROGRAMMER.

You'll have more time to become creative with your algorithm (since **H.E.L.P.** will make sure your code compiles the "first time at bat").

H.E.L.P. tracks every step you make. If you are not sure about a command, just press a key, and you'll get the kind of help you need.



Check These Features

- *Multi-window environment*
- *Interactive program checking*
- *Check syntax, semantic, type usage, intermodule inconsistencies and portability*
- *Multi-file editing*
- *Intelligent help sub-system*
- *User-definable key-board bindings*
- *Supports color and monochrome*
- ***H.E.L.P.** supports the full C Language*

NOW IN MS-DOS

Order now $395

EVEREST SOLUTIONS

Everest Solutions, Inc.
3350 Scott Boulevard
Building 58
Santa Clara, CA 95051
(408) 986-8977

Optotech, Inc.

The 5¼ inch Optical Disk Drive Is Here!

Optical Disk Drive 5984

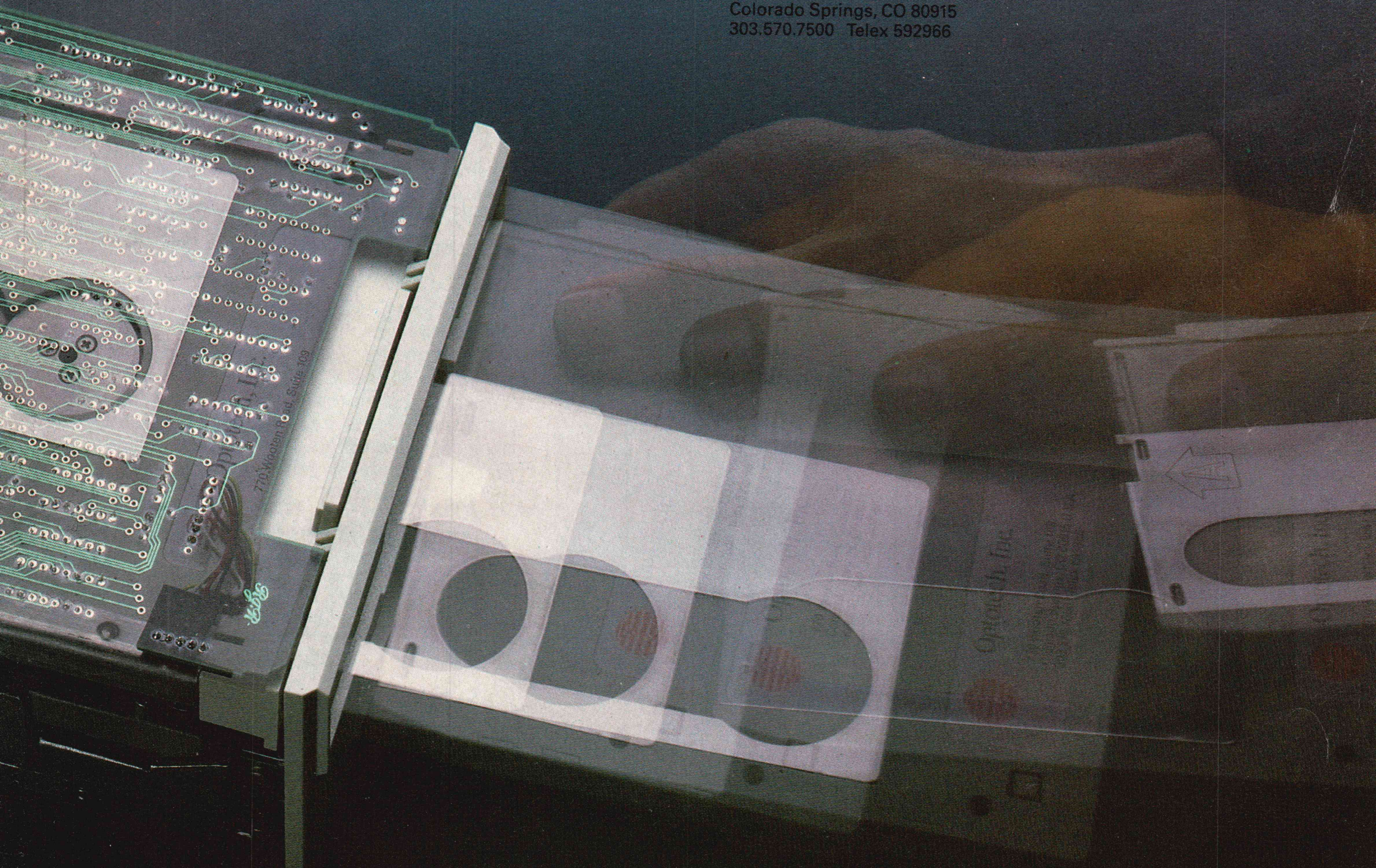
- *200 megabytes on a removable cartridge.*
- *Fast access read and write.*
- *For PCs and minis.*
- *Extensive interface software.*
- *Available Now.*

The Preferred Solution For:

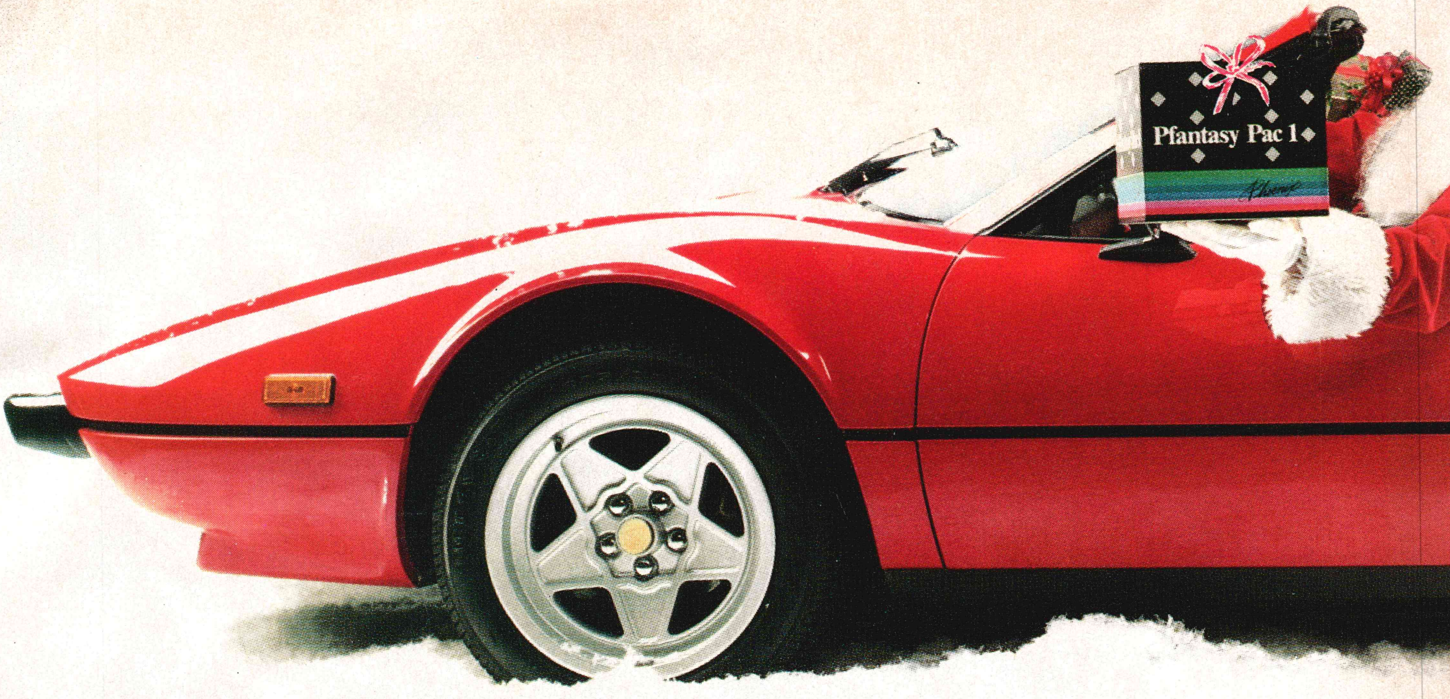
- *Database–large, portable, indelible and updatable*
- *Online Mass Storage–integral backup*
- *Imaging–capacity with removability*

Optotech, Inc.

770 Wooten Road
Colorado Springs, CO 80915
303.570.7500 Telex 592966



Circle **no. 124** on reader service card.



Buy Yourself A Pfantas
Just $~~12~~

Give your favorite programmer a holiday treat – Phoenix Pfantasy Pac1. Six of the best-engineered, highest performance programming packages on the market today. $1800 sold separately. $1295 as Pfantasy Pac1 with new software, and a unique on-line software update service. All at the one-time holiday price of $995. The perfect gift for the knowledgeable programmer. You'll get:

...Plink™86 Plus, our new linkage editor, adds a new dimension to modular programming...

Cache overlays to reduce response time. Link programs much larger than possible with standard linkers. Merge object modules so you can package them together. Reload overlays automatically, so it's easier to design program structures. Or, create up to 4,095 overlays, nested up to 32 levels, in one or many files, on one or many disks.

...Plus, Pmate,™ the text editor that works the way you do...

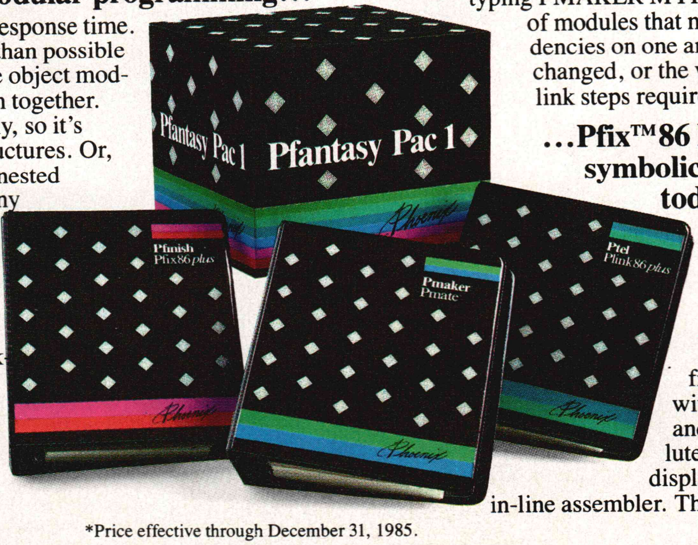
You can run Pmate in background while you perform another task, or call it up instantly while you're inside another program. With Pmate, you can reassign any command or key, so you can use keystrokes learned on other editors or make your keyboard Dvorak. And, you can assign complicated editing tasks to a keystroke, so you never have to re-key them.

...Pmaker,™ the perfect program development manager...

Like UNIX™ Make and MMF, Pmaker updates and tracks modifications in your programs. With Pmaker, generating a final copy of your program is never more complicated than typing PMAKER MYFILE, regardless of the number of modules that make up MYFILE, their dependencies on one another, the number of modules changed, or the variety of compile/assemble/link steps required to generate the program.

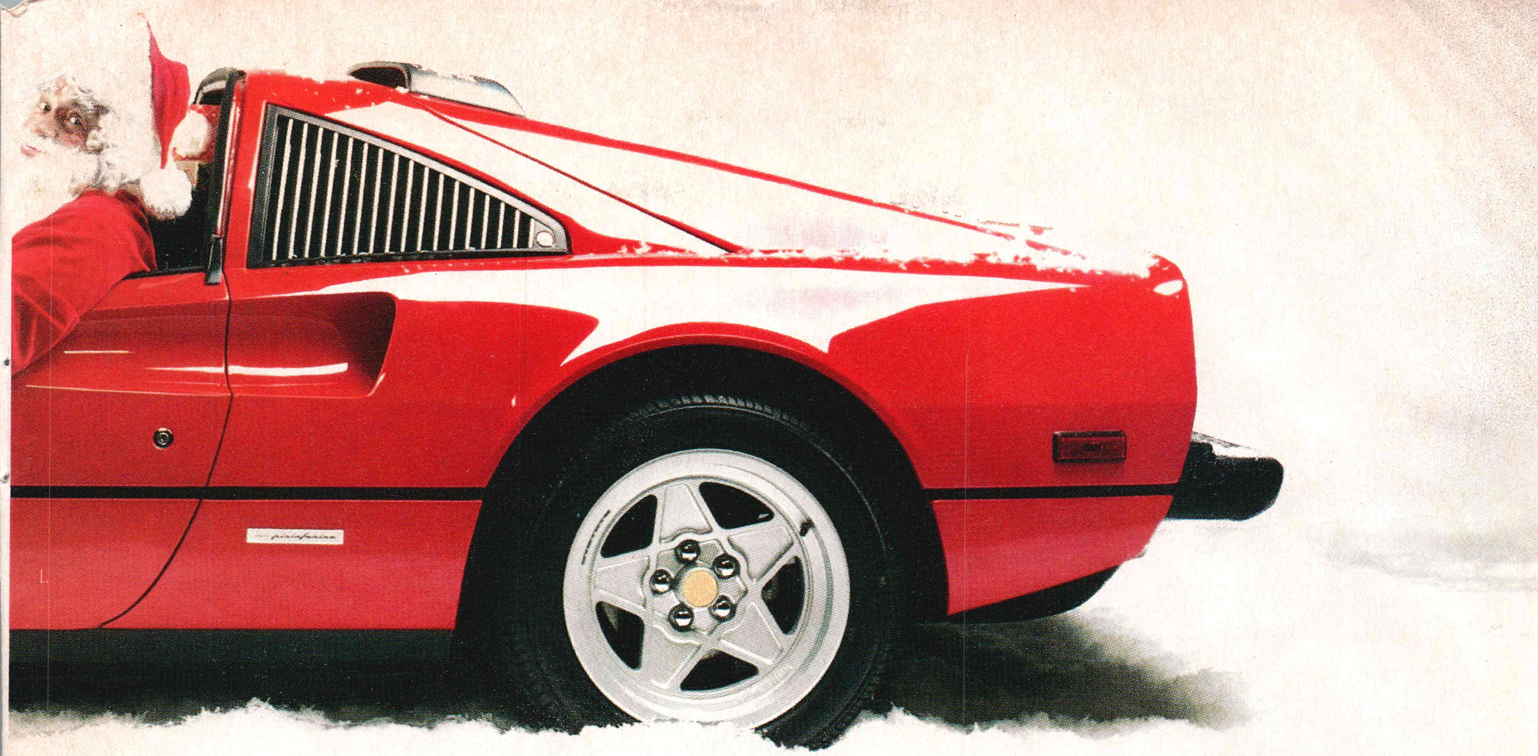
...Pfix™86 Plus, the most advanced symbolic debugger on the market today...

With its adjustable window display of source file, disassembled object, data area, stack, breakpoint settings, CPU and coprocessor registers, Pfix takes the guesswork from debugging. You can debug without a listing, since you can see and enter symbolic names or absolute addresses in breakpoints, data displays, expressions, or with the in-line assembler. The entire 80xx and 80xxx series of



*Price effective through December 31, 1985.

Circle **no. 139** on reader service card.



y Pac™ For The Holidays.

~~5.~~ $995.*

16-bit processors is supported, along with the user-assignable string and numeric variables, up to 100-step trace-back, and debug log to disk or printer. Breakpoints can be set in the source file window, whose display can be synchronized with the disassembled object during tracing; symbols can be added incrementally during the debug session; and the disassembly written to disk.

...Pfinish,™ the program that maximizes your program's efficiency...

Pfinish helps you turn your beta-test product into a software work of art. It analyzes your program or the entire operating environment during execution, and produces reports which tell you how much time was spent in each routine or interrupt, who called it, how many times, and much more. Wasteful, inefficient, or non-optimal areas of code become immediately apparent, whether they're in your code, the compiler library, or in the operating system routines themselves.

...Ptel™ gets the lead out of binary file transfer...

You get error-free file transfer and access to mainframes, minis, and micros. ASCII. XModem. Modem7. Telink and Kermit. MS-DOS® 2.x or 3.x. With Ptel. You can transfer 8-bit binary files over a 7-bit data path with Kermit. Masked file-name transfers with XModem. Or, transfer whole subdirectories with a single command using Telink. Ptel keeps track of the original file size and creation date. Ptel also offers a script language, backward scrolling, and the ability to handle DOS commands from inside the program.

...And, Phoenix's new on-line software update service. Free to all registered Pfantasy Pac1 owners.

Pfantasy Pac1 software works in MS-DOS/PC DOS environments, is completely language-independent, and is available for the IBM® PC, XT,™ AT,™ and compatibles, the Wang® PC, the TI Business-Pro,™ and the Tandy® 2000.

So, spoil yourself a little. Get Pfantasy Pac1, and make your favorite programmer's dream come true.

For more information contact: Phoenix Computer Products Corporation, 320 Norwood Park South, Norwood, MA 02062. Or call: (800) 344-7200. In Massachusetts (617) 762-5030.

Programmers' Pfantasies™ by

Phoenix

Programmers' Pfantasies, Pfantasy Pac, Pmaker, and Pfinish are trademarks of Phoenix Computer Products Corporation. Pmate, Pfix86 Plus, Plink86 Plus, and Ptel are trademarks of Phoenix Software Associates Ltd. MS-DOS is a registered trademark of Microsoft Corporation. Wang is a registered trademark of Wang Laboratories, Inc. Tandy is a registered trademark of Tandy Corporation. UNIX is a trademark of AT&T Bell Laboratories. IBM is a registered trademark, XT and AT are trademarks of International Business Machines Inc. TI Business-Pro is a trademark of Texas Instruments Incorporated.

Dr. Dobb's Journal

Editorial
Editor-in-Chief *Michael Swaine*
Managing Editor *Frank DeRose*
Editorial Assistant *Sara Noah*
Contributing Editors *Robert Blum, Dave Cortesi, Ray Duncan, Allen Holub*
Copy Editor *Vince Leone*
Typesetter *Jean Aring*

Production
Production Manager *Bob Wynne*
Art Director *Shelley Rae Doeden*
Production Assistant *Alida Hinton*
Cover Artist *Tom Upton*

Circulation
Sub. Fulfillment Mgr. *Stephanie Barber*
Subscription Mgr. *Maureen Kaminski*
Book Marketing Mgr. *Jane Sharninghouse*
Single Copy Sales Mgr. *Stephanie Barber*

Administration
Finance Manager *Sandra Dunie*
Business Manager *Betty Trickett*
Accounts Payable Supv. *Mayda Lopez-Quintana*
Accounts Payable Asst. *Denise Giannini*
Billing Coordinator *Laura Di Lazzaro*
Accountant *Marilyn Brown*
Adm. Coordinator *Kobi Morgan*

Advertising
Advertising Director
Shawn Horst (415) 424-0600
Advertising Sales
Walter Andrzejewski (617) 567-8361
Lisa Boudreau (415) 424-0600
Beth Dudas (714) 643-9439
Michele Beaty (317) 875-8093
Systems Manager *Ron Copeland*
Administrative Manager *Anna Kittleson*

M&T Publishing, Inc.
Chairman of the Board *Otmar Weber*
Director *C.F. von Quadt*
President *Laird Foshay*

Dr. Dobb's Journal (USPS 307690) is published monthly by M&T Publishing, Inc., 2464 Embarcadero Way, Palo Alto, CA 94303, (415) 424-0600. Second class postage paid at Palo Alto and at additional entry points.

Address correction requested. Postmaster: Send Form 3579 to *Dr. Dobb's Journal*, P.O. Box 27809, San Diego, CA 92128. **ISSN 0278-6508**

Customer Service: For subscription problems call: outside CA 800-321-3333; within CA 619-485-9623 or 566-6947. For book, back issue, or disk order problems call 415-424-1474.

Subscription Rates: $25 per year within the United States. Foreign subscription rates: $52.00 for airmail, $42.00 for surface mail. Foreign subscriptions must be pre-paid in U.S. Dollars, drawn on a U.S. Bank.

Foreign Distributor: Worldwide Media Service, Inc., 386 Park Ave. South, New York, NY 10016, (212) 686-1520 TELEX: 620430 (WUI)

Entire contents copyright © 1985 by M&T Publishing, Inc. unless otherwise noted on specific articles. All rights reserved.

ABC Audited Paid Circulation

People's Computer Company
Dr. Dobb's Journal is published by M&T Publishing, Inc. under license from People's Computer Company, 2682 Bishop Dr., Suite 107, San Ramon, CA 94583, a non-profit, educational corporation.

December 1985
Volume 10, Issue 12

CONTENTS

In this Issue

This is our second annual operating systems issue. We've tried to present a variety of tools for extending the performance of several operating systems. We looked for techniques and programs that would make software development easier: a debugging tool, techniques for expanding the available memory for programs, a conditional instruction tool for CP/M-68K.

We also took a look at three commercial products that claim to extend the performance of the MS DOS operating system: DRI's GEM, IBM's TopView, and Microsoft's Windows. We talked to developers of each product, asking what programmers need to know to develop applications compatible with these operating environments and why a programmer might want to do such a thing.

Look closely at the issue next month; it won't look quite the same. Our art director has introduced some changes inside and outside the magazine that we think you'll like.

We don't think you'll like hearing that Dr. Dobb's Clinic is closing with this issue. We don't like telling you. The resident intern, Dave Cortesi, has gone off to pursue interests having nothing to do with software. We'll miss Dave's gentle wit. We'd like to reopen the Clinic, but we haven't found anyone yet to fill Dave's shoes, and until we do, we won't.

Next month: 68000 programming.

STATEMENT OF OWNERSHIP, MANAGEMENT, AND CIRCULATION

(Act of August 12, 1970, Section 3685, Title 39, United States Code)

1. Title of Publication: Dr. Dobb's Journal, Publication No. 307690.
2. Date of Filing: October 12, 1985.
3. Frequency of Issue: Monthly (12 issues, $25).
4. Location of Known Office of Publication: 2464 Embarcadero Way, Palo Alto, CA 94303.
5. Location of Headquarters of General Business Offices of the Publishers: 2464 Embarcadero Way, Palo Alto, CA 94303.
6. Names and Addresses of Publisher, Editor, and Managing Editor: Publisher, Laird Foshay, 2464 Embarcadero Way, Palo Alto, CA 94303. Editor, Michael Swaine, 2464 Embarcadero Way, Palo Alto, CA 94303. Managing Editor, Frank DeRose, 2464 Embarcadero Way, Palo Alto, CA 94303.
7. Owner: Otmar Weber, 2464 Embarcadero Way, Palo Alto, CA 94303; and C. F. Von Quadt, 2464 Embarcadero Way, Palo Alto, CA 94303.
8. Known Bondholders, Mortgages, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages or Other Securities: Markt & Technik, Hans-Pinsel-Strasse 2 8013 Haar bei Munich W. Germany.
9. Extent and Nature of Circulation:
   A. Total number of copies printed: Average number of copies each issue during the preceding 12 months: 41,693. Actual number of copies of single issue published nearest to filing date: 45,037.
   B. Paid Circulation. 1. Sales through dealers and carriers, street vendors, and counter sales. Average number of copies each issue during preceding 12 months: 8,707. Actual number of copies of single issue published nearest to filing date: 7,815. 2. Mail subscriptions. Average number of copies each issue during preceding 12 months: 26,568. Actual number of copies of single issue published nearest to filing date: 30,417.
   C. Total Paid Circulation. Average number of copies each issue during preceding 12 months: 35,275. Actual number of copies of single issue published nearest to filing date: 38,232.
   D. Free distribution by mail, carrier, or other means, samples, complimentary, and other free copies. Average number of copies each issue during preceding 12 months: 2,353. Actual number of copies of single issue published nearest to filing date: 3,305.
   E. Total distribution. Average number of copies each issue during preceding 12 months: 37,628. Actual number of copies of single issue published nearest to filing date: 41,537.
   F. Copies not distributed. 1. Office use, left over, unaccounted, spoiled after printing. Average number of copies each issue during preceding 12 months: 150. Actual number of copies of single issue published nearest to filing date: 150. 2. Returns from news agents. Average number of copies each issue during preceding 12 months: 3,915. Actual number copies of single issue published nearest to filing date: 3,350.
   G. Total. Average number of copies each issue during preceding 12 months: 41,693. Actual number of copies of single issue published nearest to filing date: 45,037.

I certify that the statements made by me above are correct and complete.

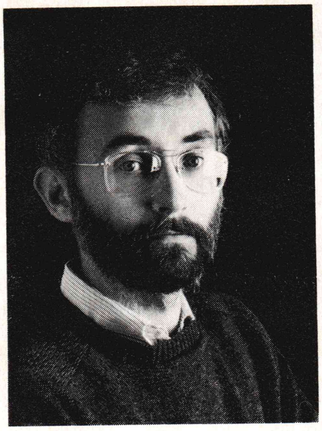
Laird Foshay, Publisher

Dr. Dobb's Journal

ARTICLES

COLUMNS

DEPARTMENTS



It's been a litigious autumn in the software industry. At press time, Apple had forced DRI into changing the GEM Desktop; Apple lawyers were eyeing Atari and Microsoft; and Atari, anxious to get its software into ROM, was reportedly ready to challenge Apple. Apple's contention that its copyright protected not only the expression of algorithms in code but also the visual expression of the desktop (and implicitly that it had invented that desktop) had yet to be tested in court.

Adapso had been running ads attempting to educate software users about the criminal nature of unauthorized copying of software. Several software publishers had brought suit against customers to aid in the pedagogical process—all in reaction to a perceived loss of (potential) revenues and all very reminiscent of a campaign by the author of MITS BASIC a decade earlier. It wasn't a good tactic then to call your (potential) customers thieves and probably isn't now, but how are authors' and publishers' investments in software to be protected without alienating users?

Vault, a manufacturer of a copy-protection product, concluded that a Canadian company must have illegally disassembled Vault's code in order to produce its unlocking product; so Vault found a state in which it thought it could get a decision in its favor and sued. Vault lost, but one decision in a Louisiana court hardly dissipates the moral ambiguity that surrounds the entire copy-protection issue. Do we really want this escalating arms race between protectors and crackers?

The Vault case dealt with trade secrets. Copyright applies to works that are in some manner made public. No author of a book would object to someone analyzing his work in order to understand it—disassembling it, if you will. Trade secrets, on the other hand, are necessarily secret. Whom do trade secrets protect, and whom does copyright protect? Many software publishers treat the two protection methods as compatible, but does it really make sense that you can protect as a trade secret something protected under copyright law? As a book reviewer I could, under the fair-use interpretation of copyright law, excerpt and analyze a work of literature. Could I, as a software reviewer, disassemble and publish portions of commercial programs to show the workings of key algorithms?

These questions suggest, at the very least, that not everyone is of one mind regarding the protection of intellectual property. They also suggest something more alarming: that precedents are being set and opinions are being molded by bluster and threat, by cases that never come to court, and by venue-choosing ploys that take advantage of differing levels of understanding of the issues in different states. It shouldn't be that way.

You could do something about it. You probably know more about the issues than do most journalists, judges, or jurors. And I suspect you may have more empathy for the user than does the average software publisher, who often has stockholders to answer to. I urge you to make your expertise available to those making decisions with long-term implications. Educate lawyers and editors.

Become an expert witness for rational software law.

Michael Swaine

Michael Swaine

AZTEC

The C for Microcomputers

PC-DOS, MS-DOS, CP/M-86, Macintosh, Amiga, Apple II, CP/M-80, Radio Shack, Commodore, XENIX, ROM, and Cross Development systems

MS-DOS, PC-DOS, CP/M-86, XENIX, 8086/80x86 ROM

Manx Aztec C86

"A compiler that has many strengths . . . quite valuable for serious work"

Computer Language review, February 1985

Great Code: Manx Aztec C86 generates fast executing compact code. The benchmark results below are from a study conducted by Manx. The Dhrystone benchmark (CACM 10/84 27:10 p1018) measures performance for a systems software instruction mix. The results are without register variables. With register variables, Manx, Microsoft, and Mark Williams run proportionately faster, Lattice and Computer Innovations show no improvement.

	Execution Time	Code Size	Compile/ Link Time
Dhrystone Benchmark			
Manx Aztec C86 3.3	34 secs	5,760	93 secs
Microsoft C 3.0	34 secs	7,146	119 secs
Optimized C86 2.20J	53 secs	11,009	172 secs
Mark Williams 2.0	56 secs	12,980	113 secs
Lattice 2.14	89 secs	20,404	117 secs

Great Features: Manx Aztec C86 is bundled with a powerful array of well documented productivity tools, library routines and features.

Optimized C compiler	Symbolic Debugger
AS86 Macro Assembler	LN86 Overlay Linker
80186/80286 Support	Librarian
8087/80287 Sensing Lib	Profiler
Extensive UNIX Library	DOS, Screen, & Graphics Lib
Large Memory Model	Intel Object Option
Z (vi) Source Editor -c	CP/M-86 Library -c
ROM Support Package -c	INTEL HEX Utility -c
Library Source Code -c	Mixed memory models -c
MAKE, DIFF, and GREP -c	Source Debugger -c
One year of updates -c	CP/M-86 Library -c

Manx offers two commercial development systems, Aztec C86-c and Aztec C86-d. Items marked -c are special features of the Aztec C86-c system.

Aztec C86-c Commercial System $499
Aztec C86-d Developer's System $299
Aztec C86-p Personal System $199
Aztec C86-a Apprentice System $49

All systems are upgradable by paying the difference in price plus $10.

Third Party Software: There are a number of high quality support packages for Manx Aztec C86 for screen management, graphics, database management, and software development.

C-tree $395	**Greenleaf $185**
PHACT $250	**PC-lint $98**
HALO $250	**Amber Windows $59**
PRE-C $395	**Windows for C $195**
WindScreen $149	**FirsTime $295**
SunScreen $99	**C Util Lib $185**
PANEL $295	**Plink-86 $395**

MACINTOSH, AMIGA, XENIX, CP/M-68K, 68k ROM

Manx Aztec C68k

"Library handling is very flexible . . . documentation is excellent . . . the shell a pleasure to work in . . . blows away the competition for pure compile speed . . . an excellent effort."

Computer Language review, April 1985

Aztec C68k is the most widely used commercial C compiler for the Macintosh. Its quality, performance, and completeness place Manx Aztec C68k in a position beyond comparison. It is available in several upgradable versions.

Optimized C	Creates Clickable Applications
Macro Assembler	Mouse Enhanced SHELL
Overlay Linker	Easy Access to Mac Toolbox
Resource Compiler	UNIX Library Functions
Debuggers	Terminal Emulator (Source)
Librarian	Clear Detailed Documentation
Source Editor	C-Stuff Library
MacRam Disk -c	UniTools (vi,make,diff,grep) -c
Library Source -c	One Year of Updates -c

Items marked -c are available only in the Manx Aztec C86-c system. Other features are in both the Aztec C86-d and Aztec C86-c systems.

Aztec C68k-c Commercial System $499
Aztec C68d-d Developer's System $299
Aztec C68k-p Personal System $199
C-tree database (source) $399
AMIGA, CP/M-68k, 68k UNIX call

Apple II, Commodore, 65xx, 65C02 ROM

Manx Aztec C65

"The AZTEC C system is one of the finest software packages I have seen"

NIBBLE review, July 1984

A vast amount of business, consumer, and educational software is implemented in Manx Aztec C65. The quality and comprehensiveness of this system is competitive with 16 bit C systems. The system includes a full optimized C compiler, 6502 assembler, linkage editor, UNIX library, screen and graphics libraries, shell, and much more. The Apple II version runs under DOS 3.3, and ProDOS, Cross versions are available.

The Aztec C65-c/128 Commodore system runs under the C128 CP/M environment and generates programs for the C64, C128, and CP/M environments. Call for prices and availability of Apprentice, Personal and Developer versions for the Commodore 64 and 128 machines.

Aztec C65-c ProDOS & DOS 3.3 $399
Aztec C65-d Apple DOS 3.3 $199
Aztec C65-p Apple Personal system $99
Aztec C65-a for learning C $49
Aztec C65-c/128 C64, C128, CP/M $399

Distribution of Manx Aztec C

In the USA, Manx Software Systems is the sole and exclusive distributor of Aztec C. Any telephone or mail order sales other than through Manx are unauthorized.

Manx Cross Development Systems

Cross developed programs are edited, compiled, assembled, and linked on one machine (the HOST) and transferred to another machine (the TARGET) for execution. This method is useful where the target machine is slower or more limited than the HOST, Manx cross compilers are used heavily to develop software for business, consumer, scientific, industrial, research, and educational applications.

HOSTS: VAX UNIX ($3000), PDP-11 UNIX ($2000), MS-DOS ($750), CP/M ($750), MACINTOSH ($750), CP/M-68k ($750), XENIX ($750).

TARGETS: MS-DOS, CP/M-86, Macintosh, CP/M-68k, CP/M-80, TRS-80 3 & 4, Apple II, Commodore C64, 8086/80x86 ROM, 68xxx ROM, 8080/8085/Z80 ROM, 65xx ROM.

The first TARGET is included in the price of the HOST system. Additional TARGETS are $300 to $500 (non VAX) or $1000 (VAX).

Call Manx for information on cross development to the 68000, 65816, Amiga, C128, CP/M-68K, VRTX, and others.

CP/M, Radio Shack, 8080/8085/Z80 ROM

Manx Aztec CII

"I've had a lot of experience with different C compilers, but the Aztec C80 Compiler and Professional Development System is the best I've seen."

80-Micro, December, 1984, John B. Harrell III

Aztec C II-c (CP/M & ROM) $349
Aztec C II-d (CP/M) $199
C-tree database (source) $399
Aztec C80-c (TRS-80 3 & 4) $299
Aztec C80-d (TRS-80 3 & 4) $199

How To Become an Aztec C User

To become an Aztec C user call 1-800-221-0440 or call 1-800-832-9273 (800-TEC WARE). In NJ or outside the USA call 201-530-7997. Orders can also be telexed to 4995812.

Payment can be by check, COD, American Express, VISA, Master Card, or Net 30 to qualified customers.

Orders can also be mailed to Manx Software Systems, Box 55, Shrewsbury, NJ 07701.

How To Get More Information

To get more information on Manx Aztec C and related products, call 1-800-221-0440, or 201-530-7997, or write to Manx Software Systems.

30 Day Guarantee

Any Manx Aztec C development system can be returned within 30 days for a refund if it fails to meet your needs. The only restrictions are that the original purchase must be directly from Manx, shipped within the USA, and the package must be in resalable condition. Returned items must be received by Manx within 30 days. A small restocking fee may be required.

Discounts

There are special discounts available to professors, students, and consultants. A discount is also available on a "trade in" basis for users of competing systems. Call for information.

MANX

To order or for information call:

800-221-0440

UNIX is a registered TM of Bell Laboratories, Lattice TM Lattice Inc., C-tree TM Faircom, Inc., PHACT TM PHACT ASSOC., CI Optimizing C86 TM Computer Innovations, Inc., MACINTOSH, APPLE TM APPLE, INC., Pre-C, PLINK 86, TM PHOENIX, HALO TM Media Cybernetics, Inc., C-terp, PC-lint TM GIMPLE Software, Windscreen, SunScreen TM SunTec, PANEL TM Roundhill Computer Systems Ltd., WINDOWS FOR C TM Creative Solutions, XENIX, MS TM MICROSOFT INC., CP/M TM DRI, AMIGA, C64, C128 TM COMMODORE Int.

Circle **no. 108** on reader service card.

Small-C

Dear *DDJ*,

The Small-C problem reported by Gregor Owen (Letters, July 1985) has already been identified, fixed, and reported to Small-C users on my mailing list. It also appears in the "Small-C Update" article (*DDJ*, August 1985).

As it turns out, Owen's change does not address the real problem and introduces serious problems of its own. It is generally not a good idea simply to remove functions from a program even if they are referenced only once. Most programmers have reasons, other than the introduction of bugs, for placing even poorly documented functions in programs.

The function result( ) serves the vital role of causing the expression analyzer to note for binary operators whether or not the result is an address, and if so whether it is a character or integer address. Removing it will cause the analyzer always to assume the attributes of the left operand for the operator value. For example, "addr1 – addr2" should yield an integer result indicating the number of objects (bytes or words) between the two addresses. Without result( ), Small-C will think it has another address, and that has ramifications for the further process of expression evaluation.

The real problem was that the analyzer was losing track of the attributes of the lvalue for ?= operators when the right side evaluated to an address. The correction was to make hier1( ) (in CC31.C) remember two of the lvalue attributes for use at store time. This is done as follows:

1. define the local integer array lval3[2] after lval2[8].
2. between "if(k==0) . . ." and "if(lval[1]) . . ." insert

```
lval3[0] = lval[0];
lval3[1] = lval[1];
```

3. change the call to store( ) to read

```
store(lval3);
```

Owen's change appeared to work because in his test case the error he introduced caused the compiler to sidestep the original problem. The troublesome statement was:

```
1ptr += r - bytes
```

where "r" was an integer and "bytes" was an array name (yields the array address). As mentioned above, the removal of result( ) would cause "r – bytes" to yield an integer result, thereby avoiding the original problem.

By the way, one might question the meaning of an integer minus an address. K&R point out on page 99 that such expressions are illegal.

Jim Hendrix
Rt. 1, Box 585
Oxford, MS 38655

Information Age Issues

Dear *DDJ*,

Please continue publishing articles like Dean Gengle's "Information Age Issues" (June 1985). Such ethical issues are too important to leave in the hands of a systems designer.

I must, however, take issue with Gengle's comment that "no one is talking about our rights to access information that is *not* private and that was collected legally at taxpayers' expense. Census data and Library of Congress information come to mind."

Your readers should know that both the American Library Association Government Documents Roundtable and the Special Libraries Association Government Relations Committee have indeed been talking about it. In addition, the Joint Committee on Printing of the Congress, which oversees the Government Printing Office, has been very concerned that material produced in machine-readable form by Federal agencies has not been made available to the GPO for distribution to the public through the depository libraries because it is not "printed."

Librarians protested strongly the distribution of census data in microfiche-only format because such data is not readily accessible to the poor or illiterate. Distribution on magnetic tape is a great service to those who can afford to have the tapes processed but may harm those who depend on such data for distribution of entitlement program benefits.

Write to your representatives and and urge them to support the efforts of the Joint Committee on Printing, the ALA, and SLA.

I'm not sure what Gengle is referring to by "Library of Congress information." He may be suffering from the misinformation provided by an episode of the television program "Whiz Kids" in which the elfin heroes broke into the Library of Congress computers and did a homework assignment. I doubt if there are any files at the LC, or anywhere else for that matter, that could produce the results obtained. In fact, the files at the LC are bibliographic, containing references to literature, but not full texts—at least not yet. Not only are these bibliographic files available to the public at the LC but they are available on magnetic tape to libraries and other institutions throughout the world. Many libraries located in this country access those records through OCLC, a bibliographic utility with over 11 million records. Some agencies do apparently try to hide

ORDER NOW! Prices on PCUNIX™ and PCVMS™ go up to $99 effective January 1, 1986

Wendin® puts Power and Punch in your PC

Operating System Toolbox™ only $99.00

Operating System Toolbox™ is a software construction set that enables you to build your own multitasking, multiuser operating system. All you need is your creativity and imagination to write a shell and link it with the Toolbox. What you receive for your effort is an operating system that interacts with the way **YOU** work, performs the jobs that **YOU** need in the way **YOU** want them done. Toolbox runs MS-DOS and PC-DOS programs with full source code written in Microsoft "C", organized into seven basic modules, all on disk. The package includes both source and object code for each module (just in case you don't have Microsoft "C"), plus a fantastic, in-depth, step-by-step instruction manual on how to build your personal operating system.

The best part of the news is the price — so low, you'll want to order today, just to keep up with the state of the art in operating systems.

PCUNIX™ only $49.00

PCUNIX™ is powerful! It is a true multitasking, multiuser operating system similar to the popular UNIX® operating system from AT&T. This first release includes 30 utilities, designed to make your program development a snap.

PCUNIX™ is versatile! It runs MS-DOS and PC-DOS programs, so that you'll never have to buy another set of development tools! Simply use your existing compilers and linkers. You need nothing more! As with the development of all of our Operating Systems, Wendin has used the Wendin Operating System Toolbox™ to construct PCUNIX™. Because of this, your programs will have access to the over 70 enhanced system services found in the Wendin Operating System Toolbox!™

PCUNIX™ is complete! Full source code to the shell and all utilities, written in "C", is included with this incredible package. And if you would like the source to Wendin's Personal Operating System Kernel, you may also want to purchase the Wendin Operating System Toolbox.™

PCVMS™ only $49.00

PCVMS™ is Wendin's version of the popular VAX/VMS operating system, which was developed by Digital Equipment Corporation for their line of VAX computers. PCVMS™ turns your IBM-PC, XT, AT, or true compatible into a supercharged, multitasking, multiuser workstation that runs MS-DOS and PC-DOS programs.

As with the development of all of our Operating Systems, Wendin has used the Operating System Toolbox™ to construct PCVMS, allowing your programs access to the over 70 enhanced system services available in the Toolbox.

PCVMS™ comes with full source code to the PCVMS™ shell and its utilities, all written in "C". If you also want the source to Wendin's Personal Operating System Kernel, you may want to purchase the Wendin Operating System Toolbox.™

XTC® only $99.00

XTC® is the world's first multitasking editor for the IBM-PC. It also runs on IBM-XT and IBM-AT computers, as well as true compatibles. Designed BY programmers FOR programmers, XTC is the ultimate editing tool for software developers using C, PASCAL, ASSEMBLY, BASIC, FORTRAN, and other languages.

Why is XTC® the ultimate tool for editing in your development environment? Because it has powerful features like MULTITASKING MACROS, WINDOWS, TEXT BUFFERS, UNDO N TIMES, MACRO PROGRAMMING CONTROL STRUCTURES and VARIABLES, as well as blinding speed that leaves other editors in the stone age.

XTC® comes with full source code written in Microsoft Pascal, on 2 DSDD disks.

ORDER HOTLINE
509/235-8088
Master Card & Visa

Foreign orders inquire about shipping.
Domestic orders add $3.50/1st item, $1.00 each additional item for shipping, handling and insurance.

Washington residents add 7.8% sales tax.

WENDIN®
BOX 266
CHENEY, WA 99004

The people who make quality software tools affordable.

DEALER INQUIRIES WELCOME!

PC-DOS is a trademark of IBM
MS is a trademark of Microsoft
Unix is a trademark of AT&T
VAX/VMS is a trademark of Digital Equipment Corporation

Wendin and XTC are Registered Trademarks of Wendin, Inc.

PCVMS, PCUNIX, and Operating System Toolbox are Trademarks of Wendin, Inc.

Circle no. 112 on reader service card.

their information from the public, but the Library of Congress certainly does not.

Bruce B. Cox
Documents Librarian and
Automation Committee
Linda Hall Library
5109 Cherry Street
Kansas City, MO 64110

C Compiler Review

Dear *DDJ*,

I read with great interest your August 1985 review of MS DOS C compilers. I have two comments I would like to interject into the debate.

First, regarding the review of the documentation—this is always a touchy area, being rather subjective in impact—I am not convinced that a C compiler manual should include what is essentially a rehash of the standard K&R syntax chapters nor a rehash of the standard Unix manual's chapters 2 and 3. That is, unless a compiler and run-time library deviate from these accepted standards, I see no reason to repeat them. It only serves to confuse. As an example, I find the Lattice C documentation difficult to use because I generally expect it to be similar to the Unix manual. It isn't, and I always get lost trying to find something.

It is much better simply to include a "pointer" to the appropriate documentation with the caveat that any functions and/or syntactic notes included in the product's manual imply a deviation from the norm. Sort of like a "search path" if you will. One uses the Unix and K&R manuals unless the product's manual overrides them.

Second, the authors did not include as a criterion of judgement the number of other products that support a particular compiler. For instance, although Lattice C does not necessarily produce the tightest code nor run the quickest, it is important that one can obtain interfaces to major products. The Oracle DBMS includes a host-language interface (HLI) to Lattice C, and a HLI to dBASE II and III can be obtained from Lattice. Such interfaces are of great significance, and in these systems the choice of compiler will hinge entirely upon that single criterion. It is better, in other words, to put up with slightly slower execution than to have to generate in house an entire nontrivial HLI.

Otherwise, I was pleased with the review—it was obviously a strong effort. It is gratifying to this C and Unix nut to see the wide interest in these tools for programmers.

Brian Jay Wu
P.O. Box 203
Newbury Park, CA 91320

Dear *DDJ*,

When I heard that your magazine was going to do a review of C compilers and interpreters, I couldn't wait to read it.

The cover for the August 1985 issue claims that the review of C compilers is definitive. I think the review is marginally useful and generally misleading. Information important to the potential user was omitted. A list of considerations relating to the usefulness of the various C compilers follows:

1. Good luck to anyone who purchases the Microsoft compiler Version 3.0 without a hard disk! The four passes of the compiler total 290K, the CL.EXE driver takes 27K, the linker takes 41K, and the libraries needed total at least 120K. Add it up and you get a whopping 478K.

It is becoming common to run a compiler from inside your editor.

140 MB disk/tape subsystem for XENIX

Finally, a complete XENIX subsystem for the AT.

Disk Features
- 30, 40, 55, 72, 118 Megabytes (formatted)
- Combine drives with each other or existing drive
- 25 milliseconds average access time
- Simplified installation
- Necessary file modifications done automatically

Tape Features
- 60 Megabyte 1/4 inch cartridge
- Standard XENIX commands (cpio, tar, dd, etc.)
- Fully integrated driver software

Subsystem Features
- Entire subsystem fits inside the AT
- External version with 6 expansion slots available (pictured)
- One year factory warranty

Emerald
Systems Corporation
Mainframe Storage for Micros
4757 Morena Boulevard
San Diego, CA 92117
(619) 270-1994
Telex: 323458 EMERSYS
EasyLink: 62853804

Emerald & Mainframe Storage for Micros™ Emerald Systems Corp.

If you're tired of waiting, you're using the wrong file manager.

Be fast. Btrieve.™

If batch jobs and reports turn waiting time to nighttime, then wake up! You're using the wrong file manager.

Btrieve™ file management hates waiting as much as you do. It's written in assembly language especially for the IBM PC. And based on b-tree file indexing, with automatic balancing for access speed that won't degrade as your database grows. With Btrieve, your applications always run fast. So you'll be out the door faster.

The standard for networking. When your application requires multi-user file sharing, Btrieve/N (network version) sets the standard for the industry's most popular LANs: IBM's PC Network, Netware, Omninet, PC Net, Ether Series, Nestar, and NetOne. Btrieve/N offers *safe* network file management that coordinates simultaneous updates and prevents lost data.

Automatic file recovery. Btrieve provides automatic file recovery after a system crash, so accidents and power failures don't turn into database disasters. Your Btrieve data always comes back intact.

Fully-relational data management. Using SoftCraft's entire family of products gives you a complete, fully-relational database management system. Rtrieve™ adds report writing capabilities for generating the reports you need. Xtrieve™ speeds users through database queries with interactive, on-screen menus—no command language or special syntax.

For professional programmers. Btrieve is the fast, reliable answer for all your application development. In any development language—BASIC, Pascal, COBOL, C, FORTRAN, and APL. With multikey access to records. Unlimited records per file. Duplicate, modifiable, and segmented keys. With Btrieve, you can develop better applications faster. And know they'll run—*fast.*

Now available for XENIX

Suggested retail prices: Btrieve, $245; Btrieve/N, $595; Xtrieve, $195; Xtrieve/N, $395; Rtrieve, $85; Rtrieve/N, $175. Requires PC-DOS or MS-DOS 1.X, 2.X, or 3.X.

Btrieve, Xtrieve, and Rtrieve are trademarks of SoftCraft Inc.

SoftCraft Inc.
P. O. Box 9802 #917
Austin, Texas 78766
(512) 346-8380 Telex 358 200

Circle no. 113 on reader service card.

COMMAND.COM needs about 18K and a programmer's editor may need 100K or more. We haven't even started to include a debugger, assembler, other libraries, object modules, or header files. In general, it would be nice to know the amount of space needed by the compiler, libraries, linker, and other assorted software the compiler needs to run.

2. The object-module format of the compilers was not mentioned. Microsoft compatibility may be an important issue for some people, especially those who buy libraries.

3. The assembler that comes with the Mark Williams compiler does not use Intel mnemonics.

4. The review mentions that the large model for Lattice allows disabling of pointer range checking, which avoids a wraparound on a 64K boundary when doing pointer arithmetic. Nowhere was it mentioned how perilous such an undertaking can be on a project of any size!

5. Several of the compilers support in-line assembly, which is extremely useful. I did not see any mention of the DeSmet or DRI compilers supporting that feature.

6. The DeSmet debugger, an excellent tool, wasn't even looked at!

7. The DeSmet compiler doesn't support the large memory model but does come with an overlay linker.

8. Although it can be useful to look at the size of the .EXE file produced by a compiler and linker, sometimes you want to know the sizes of the code and data produced by the compiler as well. Will the compiler tell you those statistics?

9. The reviewers didn't mention tradeoffs between compile/link time vs. speed of executable code (using an optimizer pass, for example).

10. The fact that Lattice and Computer Innovations automatically provide run-time stack-overflow checking was not mentioned.

I would like to have seen more of an attempt to separate out evaluations of the compilers from the associated libraries. I couldn't care less about the performance of libraries, since for applications that require speed and efficiency I write my own routines.

I have a second reason for writing. It seems to me that people deciding which compiler to choose might benefit from feedback from programmers actually using C compilers. Since C compilers are used in a wide variety of applications and environments under MS DOS, readers would likely get different kinds of information than a reviewer would provide. Why not allocate space for a running column where readers can sound off about their favorite compiler and give reasons why they like it?

If you readers like that idea, write to *DDJ* about the compiler you like to work with, mentioning aspects that haven't been covered. *[We would welcome this input.—Ed.]* Include your work environment (network, single-user, etc.); machine; any idiosyncracies or work requirements on programming style; and why the compiler you work with is the greatest thing since *DDJ*.

Tom Hogan
12801 Frost Rd.
Kansas City, MO 64138

DDJ

Circle no. 106 on reader service card.

Mark Williams

Now the biggest name in C compilers comes in a size everybody can afford.

Let's C.™

Introducing Mark Williams' $75 C compiler. Want to explore C programming for the first time? Or just on your own time? Now you can do it in a big way without spending that way. With Let's C.

This is no little beginner's model. Let's C is a powerful programming tool, packed with all the essentials of the famous Mark Williams C Programming System. The one chosen by Intel, DEC, Wang and thousands of professional programmers. The one that wins the benchmarks and the reviewers' praise:

"(This compiler) has the most professional feel of any package we tested..."—BYTE

"Of all the compilers reviewed, (it) would be my first choice for product development."—David W. Smith, PC WORLD

And now for more big news. Get our revolutionary csd C Source Debugger for just $75, too. You can breeze through debugging at the C source level ignoring clunky assembler code.

Affordable, powerful, debuggable. Mark Williams Let's C is the big name C compiler at a price you can handle. Get your hands on it now.

Mark Williams Let's C

- For the IBM-PC and MS-DOS
- Fast compact code plus register variables
- Full Kernighan & Ritchie C and extensions
- Full UNIX™ compatibility and complete libraries
- Small memory model
- Many powerful utilities including linker, assembler, archiver, cc one-step compiling, egrep, pr, tail, wc
- MicroEMACS full screen editor with source
- Supported by dozens of third party libraries
- Upgradeable to C Programming System for large scale applications development

Let's C Benchmark Done on an IBM-PC/XT, no 8087. Program: Floating Point from BYTE, August, 1983.

	Exec Time in Seconds
Let's C	134.20
MS 3.0	347.45

Use this coupon or charge by calling toll-free: 1-800-MWC-1700. In Ill. call 312-472-6659.

Mark Williams Let's C

$75

Please send me:

____ copies of Let's C and ____ copies of csd (C Source Debugger) at $75 each. (Ill. residents add 7% sales tax.)

☐ Check ☐ Money Order ☐ Visa, MasterCard or American Express

Name____

Address____

City____ State____ Zip____

Card #____ Exp. Date____

Signature____

Mark Williams Company

1430 West Wrightwood
Chicago, Illinois 60614

© 1985 Mark Williams UNIX is a trademark of Bell Labs.

Circle no. **102** on reader service card.

by D. E. Cortesi

Clinic to Close

The Clinic opened for business in May 1981. Now, four and one half years later, career changes compel me to close it down. The landlord will soon install new and interesting enterprises on the premises, but I thought I'd use our last meeting to look back and say thanks.

Two things come to mind when I reflect on the column. The first is trivial: that damned editorial We. I can't say why I hobbled myself with that foolish affectation in the first column nor why I didn't drop it in the second, but I did and then I didn't and from then on I felt compelled to continue an established style.

The strongest impression I retain is of the quality of the *DDJ* readership. As originally conceived, this column was to be written mostly by its readers with the Intern editing and supplying continuity, like a radio talk show in slow motion. It never quite worked out; you readers never provided enough original material to make a column.

But you responded when your interest was caught—my goodness how you responded! I posed Don Taylor's highly abstruse problem in the mathematics of graphics and a dozen of you sent detailed, multipage discussions heavy with matrix notation. I put up David Ross's BASIC program and 20 of you sent line-by-line discussions of what it did and how to do it better. Although the column was never written by readers in the way originally planned, you did supply a lot of material, correct a lot of my mistakes, and lend me your enthusiasm over the years.

Many of those who wrote were made into co-columnists and quoted in the various issues by name. They are named once more, with the issues they graced by their presence, in the following list. For every one of those mentioned there were often two, three, or a dozen more who had the same insight but wrote later or in a less quotable way. My personal thanks to all who wrote—it's been a privilege to associate with such a classy bunch. You folks keep up the good work, you hear?

Allison, Dennis	8/81, 10/81
Amelang, Loren	2/83
Asay, Matt	10/81
Ashley, Allen	7/81, 10/81
Backus, Rex	4/85
Bacon, Phillip	7/81
Baenziger, Peter	8/84
Barker, L.	7/81, 10/81, 11/81, 10/82, 10/83
Barker, David	11/85
Barr, Michael	5/84, 8/85
Bates, Dan	9/81
Bécus, Georges A.	9/81
Behler, Alan	5/83, 11/83
Bomberger, Alan	10/83
Brickell, Gavin	10/82
Briggs, R. C.	8/84
Brown, Russel	8/81
Butler, Edmund	7/81
Cage, Thomas W.	2/85, 6/85
Caldwell, Taylor	8/81
Canniff, Paul	4/85
Carr, Thomas E.	9/81
Carter, Everett	8/85
Castle, Pat	2/85
Chrapkiewicz, Thomas	8/84
Clark, David	2/84
Crowfoot, Norman	9/81
Dale, Gary	1/85
Davis, Charles	5/85
Davis, M. Patton	10/81
Dayhoff, Edward S.	11/81
Dempsey, J.	3/83
Dinsmore, Perry	11/84
Dodd, Michael S.	11/85
Driscoll, Michael	9/81
Dugan, Dan	4/82
Edgar, Gerald	7/81
English, Glenn	11/85
Enterline, Tom	8/84
Falk, Richard	3/84
Farmer, Wayne	8/81, 10/81
Fay, Jack	11/85
Feign, David	8/84
Floyd, Chet	9/84, 2/85
Fordham, Malcom	4/84
Fritz, Randolph	5/83, 6/83
Gardner, Calvin L.	8/84
Glassey, C. Roger	12/81
Goldman, Oscar,	5/84
Goodman, Bob	7/81
Grant, Steve	8/84
Greenlaw, Richard	10/81
Gunn, John Paul	2/85
Hahn, Harvey	5/83
Hammond, Nick	10/82, 6/83, 10/83, 10/85
Head, Gene	12/81
Hills, Terence	11/81
Hoats, David L.	12/81
Hoffman, Lee H.	2/85
Hole, Dr. William T.	2/85
Hoolko, Bob	7/81
Howell, Edgar	4/82
Howell, Jim	5/82, 2/84, 4/85
Hutchinson, Aubrey	2/83–6/83
Hutchinson, W. G.	4/82
Irving, Dwight	11/83
Jackson, Terry	2/85
Jensen, John Thayer	6/83
Johnson, Bruce R.	2/85
Johnston, Bill	12/81
Jones, James	4/85
Kellogg, David	6/83
Kendall, Bruce	8/82
King, David	2/84
Knipp, Ernest	10/82, 2/83
Koehler, W. B.	11/83
Komusin, Bruce	4/82, 5/82
Lane, Tom	7/82
Laurino, James	1/82, 7/83
Leonard, M. David	7/81
Levy, David	7/82

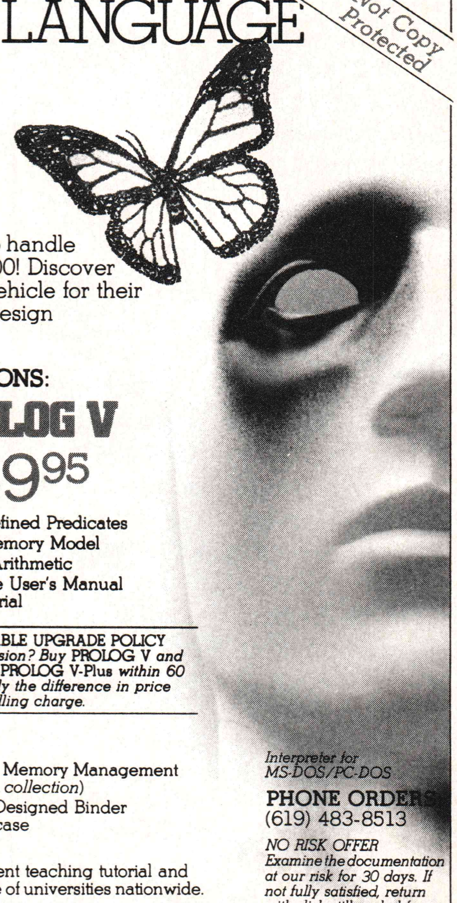
Lurie, Robert	10/81
McDaniel, C. T.	7/81
McDermott, Joseph	3/84
McKeon, Brian	4/85
McLanahan, David	1/84, 4/84, 8/84
McWorter, William A.	9/81, 5/83
Manay, Martin	10/81
Manns, Larry	11/85
Marchand, Fred	1/85
Marshall, Charles	3/84
Martin, Charles	2/85
Martin, John H.	8/81
Martin, Robert	10/81
Medlock, C. W.	5/84
Mesirov, Dick	3/84
Metzenthen, Bill	8/84
Meyer, Mike	10/84
Montgomery, Owen	5/84
Moore, Brian	3/83
Morgan, John	10/81
Neuhaus, Prof. H. J.	8/83
Newberry, Steve	2/84
Norling, Richard D.	11/84
Northrup, Mark	11/81
Novosielski, Gary P.	11/81
Nowell, Scott	11/81
Oakland, Richard L.	11/85
Oster, David	4/83
Palmer, John	10/82
Pasky, Robert	8/82
Pearson, Peter K.	8/85
Pierce, John	7/81
Pirko, Robert	3/83, 6/83, 7/83
Poli, Ray	4/82
Prince, Dr. Timothy C.	2/85
Pritchard, Steve	9/81
Pulver, Dusty	5/82
Purdum, Jack	2/84
Rivers, Wayne	1/85
Roberts, Glenn F.	7/84, 8/84
Rockwell, Charles	10/81
Ross, David	6/85, 8/85
Rouman, Jay S.	11/85
Rutiser, William A.	8/84
Saal, Harry	7/81
Sabin, Joseph	3/84, 2/85
Sackheim, Andrew	4/82
Safier, Orin	11/85
Salemma, A.	1/85
Samuel, Dan	4/82
Sand, Paul	1/85
Scardelis, Jim	4/84
Schafer, Dale	7/81
Schemm, John B.	2/85
Schuetz, Chuck	4/85
Schwab, Leonard	9/84
Semos, Steve	11/81
Shapin, Ted	4/84
Shaw, David A.	1/82, 4/82
Shaw, Jim	5/82
Shochat, David	11/85
Shuman, Dave	11/85
Smith, Billy	11/81
Smith, Burks	10/82, 2/83
Smith, Roger	8/85
Snow, J. R.	8/81
Stanek, Mitchell	9/81
Sullivan, Dave	4/84
Swearingen, Roger V.	2/85
Taylor, Bob	6/83
Taylor, Don	4/82, 8/82, 5/83
Thier, U.	7/84
Tilton, David S.	8/84, 10/84, 1/85, 4/85
Throckmorton, Jerry	10/81
Trout, Dana	10/82
Wagner, R. C.	7/84
Watzman, Barry	8/85
Wendel, J. G.	8/81
Wilkinson, Bill	7/82
Wilson, Ed	7/81
Wochnik, Michael	8/81
Wright, Don	9/82
Vieau, Dean	9/81

DDJ

Reader Ballot
Vote for your favorite feature/article.
Circle Reader Service **No. 190.**

DISCOVER THE LANGUAGE OF ARTIFICIAL INTELLIGENCE

Not Copy Protected



PROLOG V

At last! A Prolog with enough muscle to handle real-world applications for UNDER $100! Discover why Japan has chosen Prolog as the vehicle for their "Fifth Generation Machine" project to design intelligent computers.

CHOOSE FROM TWO GREAT VERSIONS:

PROLOG V-Plus $99.95

- More Than 100 Predefined Predicates
- Large Memory Model (to 640K)
- Floating Point Arithmetic
- 150-Page User's Manual and Tutorial plus Advanced Programming Documentation
- Co-Resident Program Editor
- Calls to Co-Resident Programs
- Text and Graphic Screen Manipulation

PROLOG V $69.95

- 70 Predefined Predicates
- Small Memory Model
- Integer Arithmetic
- 122-Page User's Manual and Tutorial

UNBELIEVABLE UPGRADE POLICY
Tough decision? Buy PROLOG V and upgrade to PROLOG V-Plus within 60 days for only the difference in price plus a handling charge.

STANDARD FEATURES ON BOTH:

- Clocksin & Mellish-Standard Edinburgh Syntax.
- Extensive Interactive Debugging Facilities
- Dynamic Memory Management (*garbage collection*)
- Custom-Designed Binder and Slipcase

THE CHOICE OF UNIVERSITIES
Generous university site licenses and an excellent teaching tutorial and reference guide have made PROLOG V the choice of universities nationwide. Call for details.

Interpreter for MS-DOS/PC-DOS

PHONE ORDERS
(619) 483-8513

NO RISK OFFER
Examine the documentation at our risk for 30 days. If not fully satisfied, return with disk still sealed for full refund.

☐ PAYMENT ENCLOSED $ ____________
CA residents add 6% sales tax
☐ CHARGE MY: ☐ MasterCard ☐ Visa
Card No. ____________ Exp. Date ________
Signature ____________
Mr./Mrs./Ms. ____________ (please print full name)
Address ____________
City/State/Zip ____________

PROLOG V-Plus $99.95
PROLOG V 69.95
UPGRADE ONLY 40.00
Return factory diskette and $30 plus $10 Handling

SHIPPING:
$ 5.00 U.S.
7.50 Canada
10.00 Carribean, Hawaii Air
20.00 Overseas Air

COD Orders Not Accepted
15 day check clearance

CHALCEDONY SOFTWARE
5580 LA JOLLA BLVD.
SUITE 126 D
LA JOLLA, CA
92037

Circle **no. 178** on reader service card.

A New Shell for MS DOS, Part 1: IBM Cursor Control and an Fgets that Edits

by Allen Holub

Back in March we presented a new root module for the CP/M-80 version of the Aztec C compiler. Since then, several people have written to say that the proper place for wildcard expansion, pipes, redirection, and the like is in the shell (i.e., the command interpreter), not in the C root module. There's no point in bloating the size of your programs when you don't have to. I sympathize with this attitude, but frankly, I don't want to write a new CCP for CP/M. Digital Research just makes this process too hard.

MS DOS, however, is another matter. The command interpreter, command.com, is just a program and can be replaced with any other program. Moreover, the DOS interface library provides much more in the way of system level functions than does CP/M. Most important, DOS Version 2 and higher supports an exec function that allows one program to load and execute a second program.

Because most of my gripes about MS DOS are really aimed at the behavior of command.com, it seemed to me that writing a new shell for MS DOS would be more productive than complaining for the rest of my life about the features I didn't have. C is, after all, a language remarkably well suited for writing operating systems. So, over the next few months we will look at a new shell for MS DOS.

I've implemented most of what I like about the the Unix C and Bourne shells: command line wild card expansion, redirection, history, shell variables, a reasonable language for writing shell scripts (.bat files under MS DOS) and the lot. I've also taken the opportunity to add a couple of features that I've often wished were present in the Unix shells, such as an interactive command line editor.

String Routines

We'll start looking at the shell itself next month. This month we're going to look at several support routines. As usual, these are all designed to be useful in their own right. They make up five sets. The first three listings are routines for string manipulation. They are small, but useful. Next( ) (Listing One page 19) gets from a string the next object separated by a delimiter. Its calling syntax is:

```
char *next( linep, delim, esc )
char **linep;
int delim, esc;
```

Linep is the address of a pointer that points at the first character of the string to be processed. Delim is the delimiter that separates objects. Esc is an escape character. The routine skips leading white-space (a space or tab) and remembers the position of the first non-white character. It then looks for a delimiter not preceded by an escape character and replaces the delimiter with a '\0.' It returns a pointer to the remembered non-white character and it modifies *linep to point to the first character beyond where the delimiter used to be. It won't modify *linep to point past the end of the string. If delim is a white character, leading white space won't be skipped.

Listing Two (page 19) and Listing Three (page 19) are two routines for copying. Cpy(dest,src) is functionally the same as strcpy( ). It copies the source string (src) to the destination string (dest). There is, however, one difference: whereas strcpy returns its first argument, cpy returns a pointer to the NULL at the end of the destination string. This allows us to add onto the destination string without first having to scan through the string to find its end. The second copy routine is cptolower(dest,src). Cptolower works just like cpy( ), except all uppercase characters are mapped to lower case as they are copied.

Moving the Cursor and Writing Characters

Listing Four (page 20) is a collection of low-level routines for cursor manipulation and character output for the IBM PC. These routines use direct ROM BIOS calls, and so are much faster than the usual output routines, which use the normal DOS functions[1]. Moreover, they let you move the cursor around without having to install the ANSI.SYS driver, which is excruciatingly slow. IBM has been very good about maintaining the ROM BIOS interface over different versions of the operating system. As long as you access the BIOS via the correct interrupt mechanism, the routines are portable.

I've used the int86( ) function from Lattice to generate the system video interrupt. Microsoft C has an identical function, so these routines will port to Microsoft C without any problems. The dos( ) function printed in this column in July 1985 can also be modified quite easily to generate a video interrupt. Just replace the INT 21H instruction on line 68 with an INT 10H instruction.

Listing Four contains the following routines:

getpage( )

This routine gets the currently active video page. When you are in text mode, several pages are available for writing, though only one is displayed at any given time. Getpage( ) returns the number of the page now being displayed. This information is needed by some of the other routines.

cursize(top, bot)
This routine adjusts the cursor size. Every character is represented on the display by a fixed number of scan lines. Cursize( ) causes the cursor to extend from the top scan line indicated to the bottom line indicated. For example, the standard monochrome display uses 14 lines numbered 0–13, the color adapter uses 8, numbered 0–7. So, on the color adapter, a normal underline cursor can be set up with the call cursize(6,7). You can make a large block cursor with the call cursize(0,7). Cursize(7,0) creates a two-part cursor, one line over the letter and a second line under the letter. Cursize(8,8) will make the cursor disappear.

posn = gcur(pagenum);
int pagenum;
short posn;
This routine returns the position of the cursor on the indicated video page. The position is returned in a single 16 bit short; the row number is in the top byte and the column number is in the bottom byte.

scur(posn, page)
short posn;
This modifies the cursor to rest at posn, which may be a value returned from gcur( ).

posn = getcur( );
setcur(posn);
These routines work just like scur( ) and gcur( ) except that they access the page currently being displayed.

wchar(c)
int c;
This routine writes a single character to the screen. It is dramatically faster than putchar( )—at least the one that comes with the Lattice compiler. Wchar( ) moves the cursor as it prints, just like putchar( ). However, the only control codes it recognizes are carriage return (\r), line feed (\n), bell (\007), and backspace (\b), so don't expect it to expand tabs. Also, \n is not interpreted as a "newline," but as a line feed. That is, it will get you to the current column on the next line. Use \r to get to the left edge of the current line.

wstr(s, move)
char *s;
int move;
This routine prints an entire string to the screen. If move is true, the cursor ends up positioned just past the end of the printed string. Otherwise, the cursor remains over the first character of the string. Wstr( ) uses wchar( ) as its output function.

An Fgets( ) that Edits

Listing Five (page 20) is an editing input function. Let me point out at the start that this function is general purpose in nature, even though it's written specifically for an IBM PC. It's a relatively simple matter to modify the routines for any terminal that has an addressable cursor. The primary access routine in this module is

```
char *efgets(buf, maxline, fp)
char *buf;
int maxline;
FILE *fp;
```

This is functionally similar to fgets( ), though there are several major differences. First, a pointer to the end (instead of to the start) of the loaded buffer is returned on success. A NULL is still returned on end of file. Second, line continuation is supported. If a line ends with a backslash (\), the backslash is deleted and the line is concatenated with the next line. The major differences from fgets( ) are apparent when fp is set to stdin. In this case several interactive editing functions are supported:

- LEFT-CURSOR (hit the left cursor key) moves the cursor to the left without erasing anything.
- RIGHT-CURSOR moves the cursor to the right.
- ^LEFT-CURSOR (hold down the CTRL key and hit the left cursor key) positions the cursor at the beginning of the previous word.
- ^RIGHT-CURSOR positions the cursor at the beginning of the next word.
- HOME positions the cursor at home position on the current line. Home is

MS-DOS, UNIX, APPLE MAC, CP/M, NETWORKS and MORE. ONE c-tree ISAM DOES THEM ALL!

The creator of Access Manager™ brings you the most powerful C source code, B+ Tree file handler: **c-tree**™

- multi-key ISAM and low-level B+ Tree routines
- complete C source code written to K&R standards
- single-user, network and multi-tasking capabilities
- fixed and variable record length data files
- virtually opened files accommodate limited file descriptors
- no royalties on application programs

$395 COMPLETE

Specify diskette format:
- 5¼" MS-DOS
- 8" CP/M
- 3½" Mac
- 8" RT-11

For VISA, MC and COD orders
call (314) 445-6833
FairCom
2606 Johnson Drive
Columbia, MO 65203

© 1985 FairCom

The following are trademarks: c-tree and the circular disk logo—FairCom; MS—Microsoft Inc.; CP/M and Access Manager—Digital Research Inc.; Unix—AT&T; Apple—Apple Computer Co.

Circle no. 93 on reader service card.

defined as the position of the cursor when the routine was entered. For example, if the cursor was in column 5 when efgets( ) was called, HOME puts it back in column 5. In fact, in this example there's no way to get the cursor into columns 1–4 from efgets. If a line is continued with a \<CR> combination, the cursor is moved to the HOME position of the next line, not to the left edge of the screen.

- END positions the cursor just after the rightmost character on the line.
- ESC is for an abort. The buffer is cleared, but the characters on the screen are not erased. The routine returns immediately. −1 is returned when an ESC is encountered.
- DEL deletes the character on which the cursor is resting and closes up the rest of the line to fill the gap. (i.e., if you delete the X in the string "aaaaXoooo," you end up with "aaaaoooo" on the screen, rather than "aaaa oooo").
- ^H is a destructive backspace. It moves the cursor left one space and then deletes that character, closing up the line to fill the gap.
- ^X erases the entire line and clears the buffer. However, efgets( ) doesn't return.
- ^M (CR) or Enter (LF) positions the cursor at the left edge (not the home position) of the next line and cause efgets( ) to return to the caller. A pointer to the end of the buffer (to the \0) is returned on success, NULL on end of file.

Typing any printing character causes that character to be printed at the current cursor position and the cursor to move right one space. Typing anything else has no effect. The cursor is never allowed to go past the end of the buffer, as specified by the parameter maxline in the efgets( ) call. However, when in editing mode, the cursor is not allowed to go past the end of the current line, even if maxline is longer (the bell will ring if you try). In this case, you can get to the next line with a \<CR>, but you can't edit anything on the previous line.

Conclusion

So that's the beginning. Next month we'll add some more routines to the pile and incorporate them into a simple MS DOS shell. In the following month we'll add various capabilities to that shell.

[*IBM PC readable versions of the listings for the entire shell and for MS DOS versions of various Unix utilities (e.g., grep, ls) will be made available through* DDJ *in the next couple of months. Watch this column for more details.—ed*]

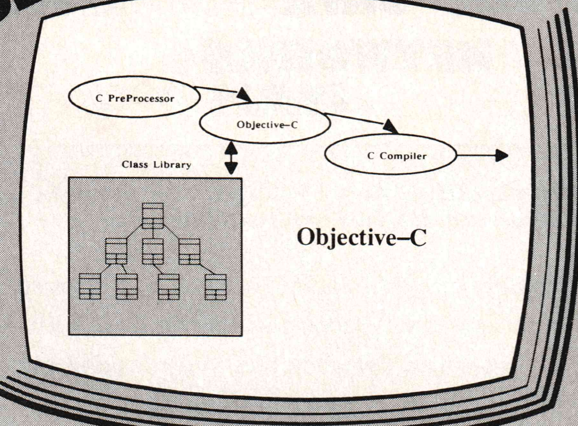
Notes

[1] An excellent description of the IBM BIOS routines and how to use them is in *The Peter Norton Programmer's Guide to the IBM PC*, by Peter Norton (Bellevue: Microsoft Press: 1985).

DDJ

(Listing begins at right)

NEW! Object-Oriented Programming on a PC!



Objective-C™ is an object-oriented programming language and a fully documented library of reuseable components...adding messages, objects and inheritance to C language. Applications written in Objective-C are fully compatible with other Objective-C compilers running under UNIX, VMS or AOS.

Objective-C provides the productivity of object-oriented programming, while retaining the portability and efficiency of C. PPI also provides comprehensive technology transfer to insure that your programmers fully understand this exciting new technology.

PPI's Objective-C compiler generates C code, which requires the Microsoft V3 C compiler running under MS/DOS.

At $500 Objective-C is affordable. Order today!

PRODUCTIVITY PRODUCTS INTERNATIONAL
27 Glen Road. Sandy Hook, CT 06482. (203) 426-1875.

PPI

VISA MasterCard AMERICAN EXPRESS

Reader Ballot
Vote for your favorite feature/article.
Circle Reader Service **No. 191**.

C Chest (Text begins on page 16)

(Text begins on page 16)

Listing One

```
/*      NEXT.C:         Skip to the next delimiter seperated object
 *
 */

#define iswhite(c) ( (c) == ' ' || (c) == '\t' || (c) == '\n' )


char    *next( linep, delim, esc )
char    **linep;
{
        /* Linep is the address of a character pointer that points to
         * a string containing a series of delim seperated objects.
         * Next will return a pointer to the first non-white object in
         * *linep, replace the first delimiter it finds with a null, and
         * advance *linep to point past the null (provided that it's not
         * at end of string). 0 is returned when an empty string is passed
         * to next(). White space may be used as a delimiter but
         * in this case white space won't be skipped. A delimiter preceded
         * by "esc" is ignored. Quoted strings are copied verbatim.
         */

        register char   *start, *end ;
        int             inquote = 0;

        if( !**linep )
                return 0;

        start = *linep;

        if( !iswhite(delim) )
                for( ; iswhite(*start) ; start++ )
                        ;

        for( end = start; *end && (*end != delim || inquote) ; end++ )
        {
                if( *end == esc  &&  *(end+1) )
                        end++;

                else if( *end == '"' || *end == '\'' )
                        inquote = ~inquote;
        }

        if( *end )
                *end++ = '\0';

        *linep = end;
        return start;
}
```

End Listing One

Listing Two

```
char    cptolower( dest, src )
char    *dest, *src;
{
        /*      Copy src to dest, mapping all upper case letters to lower
         *      case. src and dest may be the same.
         */

        for(; *src ; src++ )
                *dest++ = ('A' <= *src && *src <= 'Z')
                                        ? *src + ('a'-'A') : *src ;
        *dest = '\0' ;
        return dest  ;
}
```

End Listing Two

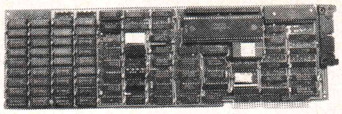
Listing Three

```
char    *cpy( dest, src )
char    *dest, *src;
{
        /*      Works like strcpy but returns a pointer to the new end
         *      of string (ie. to the null).
         */

        while( *src )
                *dest++ = *src++ ;

        *dest = 0;
        return dest;
}
```

End Listing Three

(Listing Four begins on next page)

68000 CO-PROCESSING For IBM PC, PC/XT and COMPATIBLE SYSTEMS



Now you can add the MOTOROLA 68000 16/32 Bit Processor to your PC via use of the Pro 68 Advanced Technology Co-Processor. Enjoy all of the performance benefits of the 68000 processor without sacrificing your current PC system. Consider these impressive standard features of Pro 68:

- High Speed MOTOROLA 68000 micro processor
- 10Mhz no wait state design (3 times faster than the IBM PC/AT)
- True 16/32 bit technology
- For use on IBM PC, PC/XT or compatible systems
- On board 16 bit parity checked memory, 256K to 1024K
- Two serial I/O ports for multi user interface
- Provisions for the high speed NS32081 math processor
- High speed proprietary dual port host bus interface
- Parallel or array processing via multi processor architecture
- MS/PC DOS RAM disk driver program
- Choice of two popular integrated 16/32 bit operating systems:
  - CPM68K from Digital Research Inc.
    - Full suite of development tools
    - "C" compiler with floats and UNIX I/O library
    - Many third party compatible languages and applications
  - OS9/6800 from MICROWARE Corporation
    - UNIX look alike with multi user/multi tasking, shell, hierarchical disk directory, record and file lock, pipes and filters
    - Full suite of development tools
    - UNIX V compatible "C" compiler
    - Optional languages include BASIC, ISO PASCAL, FORTRAN 77.

Pricing from $1195 includes Pro68 with 256K, OS, and MS/PC DOS RAM disk driver. HSC also manufactures and markets a full line of co-processors and RAM disks for use on Z80 based systems.

DISTRIBUTORS:

Australia-Computer Transition Systems ...03-537-2768
Great Britain-System Science ...01-248-;062
West Germany-DSC International ...089-723-1125
Canada Remote Systems ...416-239-2835

Dealer, Distributor and OEM inquiries invited.

HSC

Hallock Systems Co., Inc.
267 North Main Street
Herkimer, NY 13350
(315) 866-7125

Circle **no. 131** on reader service card.

C Chest

(Listing continued, text begins on page 16)

Listing Four

```
#include <stdio.h>
#include "/lc/dos.h"

/*   VIDBIOS.C          Various cursor and i/o routine using
 *                      the bios interrupts (see below for greater detail):
 *
 *          Copyright (C) 1985 Allen I. Holub. All rights reserved.
 *
 *   Externally accessable routines:
 *
 *    int   getpage  ()                       Get active video page #
 *    void  cursize  (top,bot)                Set cursor size
 *    void  scur     (posn, page) short posn;  Set cursor position
 *    short gcur     (pagenum)                Get cursor position
 *    void  setcur   (posn) short posn;       Set cur pos on current page
 *    short getcur   ()                       Get cur pos from cur page
 *    void  wchar    (c)                      write a single character
 *    wstr  wstr     (s, move) char *s;       write a string
 *
 */

#define VIDEO_INT      0x10    /*      Video interrupt                     */

#define CUR_SIZE       0x1     /*      Set cursor size                     */
#define SET_POSN       0x2     /*      Modify cursor posn                  */
#define READ_POSN      0x3     /*      Read current cursor posn            */
#define WRITE_TTY      0xe     /*      Write character & move cursor       */
#define GET_VMODE      0xf     /*      Get current video mode & disp pg    */

/*----------------------------------------------------------------------*/

static union REGS       Regs;

/*----------------------------------------------------------------------*/

int     getpage()
{
        /*      Returns the currently active display page number
         */

        Regs.h.ah = GET_VMODE;
        int86( VIDEO_INT, &Regs, &Regs );

        return (int) Regs.h.bh ;
}

/*----------------------------------------------------------------------*/

cursize( top_line, bot_line )
{
        /*      Scan lines are numberd 0 at the top and 7 at the bottom.
         *      if the two are reversed you'll get a 2 part cursor.
         *      Top_line determines the position of the top scan line
         *      of the cursor, bot_line is the bottom. A normal cursor
         *      can be created with cursize(6,7). Cursize(0,7) will
         *      fill the entire area occupied by a character. Cursize(0,1
         *      will put a line over the character rather than under it.
         */

        Regs.h.ch = top_line ;
        Regs.h.cl = bot_line ;
        Regs.h.ah = CUR_SIZE ;
        int86( VIDEO_INT, &Regs, &Regs );
}

/*----------------------------------------------------------------------*/

scur( posn, pagenum )
short   posn;
{
        /*      Modify current cursor position. The top byte of "posn"
         *      value holds the row, the bottom by the column.
         *      Pagenum is the video page number.
         */

        Regs.x.dx = posn     ;
        Regs.h.bh = pagenum ;
        Regs.h.ah = SET_POSN ;
        int86( VIDEO_INT, &Regs, &Regs );
}

short   gcur( pagenum )
{
        /*      Get current cursor position. The top byte of the return
         *      value holds the row, the bottom by the column.
         *      Pagenum is the video page number.
         */

        Regs.h.bh = pagenum  ;
        Regs.h.ah = READ_POSN ;
        int86( VIDEO_INT, &Regs, &Regs );

        return( Regs.x.dx );
```

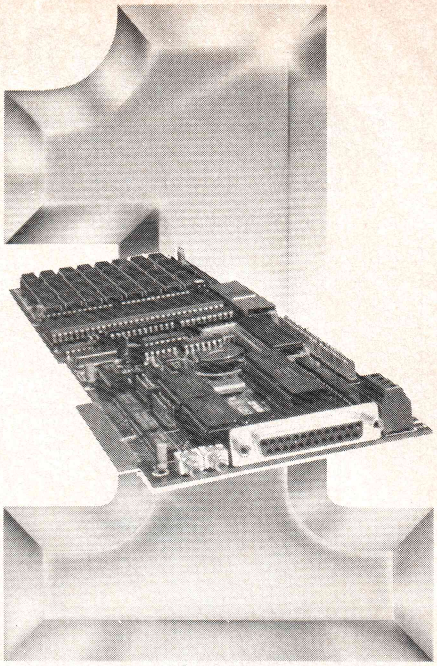
```
}

/*      Setcur and getcur work just like scur and gcur except that they
 *      access the current video page.
 */

setcur( posn )
short   posn;
{
        scur( posn, getpage() );
}
short   getcur()
{
        return gcur( getpage() );
}

/*----------------------------------------------------------------------*/

wchar( c )
{
        /*      Write a character to the screen in TTY mode. Only normal
         *      printing characters, BS, BEL, CR and LF are recognized.
         *      The cursor is automatically advanced and lines will wrap.
         */

        Regs.h.bl = 0;          /* Use current color */
        Regs.h.al = c;
        Regs.h.ah = WRITE_TTY ;
        int86( VIDEO_INT, &Regs, &Regs );
}

wstr( str, move_cur )
char    *str;
{
        /*      Write a string to the screen in TTY mode. If move_cur is
         *      true the cursor is left at the end of string. If not
         *      the cursor will be restored to its original position
         *      (before the write).
         */

        register short  posn;

        if( !move_cur )
                posn = getcur();

        while( *str )
        {
                Regs.h.bl = 0 ;
                Regs.h.al = *str++ ;
                Regs.h.ah = WRITE_TTY ;
                int86( VIDEO_INT, &Regs, &Regs );
        }

        if( !move_cur )
                setcur( posn );
}

/*----------------------------------------------------------------------*/
#ifdef DEBUG

main()
{
        cursize( 0, 7 );
        wstr( "The large cursor should be on the 'T'", 0 );
        getchar() ;

        cursize( 6, 7 );
}

#endif
```

End Listing Four

Listing Five

```
#include <stdio.h>

/*      EFGETS.C        An editing version of efgets. Recognizes \<CR>
 *                      line termination and supports editing when input
 *                      is from stdin.
 *
 *       Copyright (C) 1985 Allen I. Holub. All rights reserved.
 *
 *----------------------------------------------------------------------
 *
 * Externally accessable routines:
 *
 * void  ptail   (bp, end, move )     Print string from bp to end. Move
 *                                    cursor to end if move is true.
 * char  *egets  (start, bufsize)     Get a string from stdin w/ editing.
 *                                    get at most bufsize-1 chars.
 * char  *getl   (buf, maxline, fp)   like fgets but returns pointer to
 *                                    end of input string on success.
 * char  *efgets (buf, maxline, fp)   like getl but uses egets for
 *                                    standard input rather than getc.
```

(Continued on next page)



Number One in Performance

68010/68000 Coprocessor for IBM/AT/XT/PC-

8/10/12.5mz No Wait States

$1395.00 Qty. 1

FEATURES

- 1-2 MB RAM (1MB Standard)
- 16K-64K EPROM
- 2-8 Serial Ports Async/Sync/Bisync Communications
- Battery-backed Real Time Clock
- Battery-backed 2K-8K RAM
- 2 Parallel Ports
- Memory-mapped Dual-port BUS
- 3-9 Users Per Board (3 Standard)
- Up To 16 Boards Per AT/XT/PC
- Can Operate As Standalone Processor

SOFTWARE

- OS9 (Powerful UNiX-like Multi-user OS)
- CPM/68K
- Software selectable OS including concurrent PC DOS/OS-9 or CPM/68K operation
- Support Module for iBM Graphics
- High-speed Local/Global Disk Caching
- Basic. Pascal. Fortran. C. and COBOL

IBM is a registered trademark of International Business Machines
OS-9 is a registered trademark of Microware Systems Corp
CPM 68K is a registered trademark of Digital Research Corp
MK68000 MK68010 are registered trademarks of Motorola

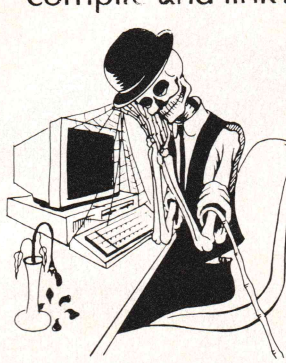
TLM Systems

4704 W. JENNIFER. SUITE 105 • FRESNO. CA 93711
209/276-2345

Circle **no. 173** on reader service card.

GROWING OLD?

...waiting for **C** programs to compile and link?



Use **C-terp**
the **complete** C interpreter

This is the product you've been waiting (and waiting) for!

Increase your productivity and avoid agonizing waits. Get instant feedback of your C programs for debugging and rapid prototyping. Then use your compiler for what it does best...compiling efficient code ...slowly.

C-terp Features

- Full K&R C (no compromises)
- Complete built-in screen editor-- no half-way house, this editor has everything you need such as multi-files, inter-file move and copy, etc. etc. For the ultimate in customization, editor source is available for a slight additional charge of $98.00.
- Fast--Linking and semi-compilation are breath-takingly fast. (From edit to run completion in a fraction of a second for small programs.)
- Convenient--Compiling and running are only a key-stroke or two away. Errors direct you back to the editor with the cursor set to the trouble spot.
- Object Module Support– Access functions and externals in object modules produced by your compiler. **New:** We are now supporting **Microsoft** 3.0, **Mark Williams** & **Aztec C** in addition to C.I. C86 & Lattice.
- Complete Multiple Module Support.
- Symbolic Debugging-- Set breakpoints, single-step, and directly execute C expressions.
- Many more features including batch mode and 8087 support.
- **Price: $300.00 (Demo $45.00) MC, VISA**

Price of demo includes documentation & shipping within U.S. PA residents add 6% sales tax. Specify compiler.

- C-terp runs on the IBM PC (or compatible) under DOS 2.x with a suggested minimum of 256Kb of memory. It can use all the memory available.

GIMPEL SOFTWARE

3207 Hogarth Lane • Collegeville, PA 19426

(215) 584-4261

*Trademarks: C86 *(Computer Innovations)*, Lattice *(Lattice Inc.)* IBM *(IBM Corp.)*, C-terp *(Gimpel Software)*, Microsoft *(Microsoft)*, Aztec *(Manx)*

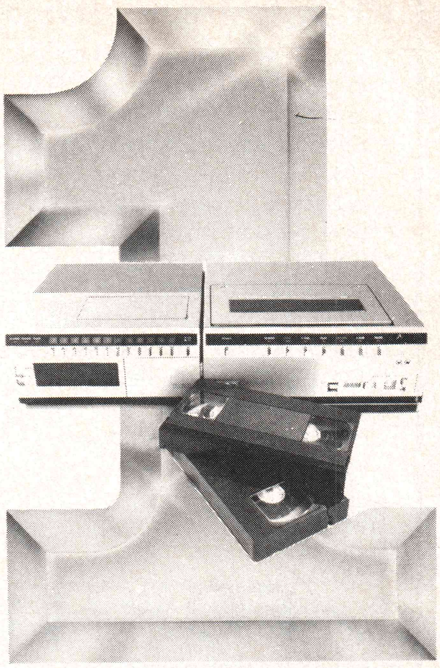
C Chest (Listing continued, text begins on page 16)

Listing Five

```
 *
 *              FILE *fp;
 *              char *buf, *bp, *end;
 *              int  move, bufsize, maxline;
 */

extern int   getpage ();          /* Sources in vidbios.c                  */
extern void  setcur  ();          /*             "                         */
extern short getcur  ();          /*             "                         */
extern void  wchar   ();          /*             "                         */
extern int   dos     ();          /* Part of the Lattice standard library*/
extern void  movemem ();          /*             "                         */

/*      Values returned from DOS when cursor keys etc. are hit:
 */

#define _LEFT           75
#define _RIGHT          77
#define _CTL_LEFT       115
#define _CTL_RIGHT      116
#define _INS            82
#define _DEL            83
#define _HOME           71
#define _END            79

/* The above are mapped as follows by getkey
 */

#define LEFT            0x80
#define RIGHT           0x81
#define CTL_LEFT        0x82
#define CTL_RIGHT       0x83
#define INS             0x84
#define DEL             0x85
#define HOME            0x86
#define END             0x87

#define BDOS_IN   8     /* raw (non echo) input function        */

#define CNTL_C  0x03            /*  ^C  */
#define CNTL_Z  0x1a            /*  ^Z  */
#define BEL     0x07            /*  ^G  */
#define ESC     0x1b            /*  ^[  */
#define CAN     0x18            /*  ^X  */


/*----------------------------------------------------------------------*/

static int      getkey()
{
        /*      Return a key from the keyboard. Keys are gotten in raw
         *      input mode and mapped as specified above if necessary.
         */

        register int    c;
        static   int    ateof   = 0;

        if( ateof )
                return EOF;

        if( !(c = bdos(BDOS_IN)) )      /* Special function key */
        {
                switch( bdos(BDOS_IN) )
                {
                case _LEFT:             return( LEFT      );
                case _RIGHT:            return( RIGHT     );
                case _CTL_LEFT:         return( CTL_LEFT  );
                case _CTL_RIGHT:        return( CTL_RIGHT );
                case _INS:              return( INS       );
                case _DEL:              return( DEL       );
                case _HOME:             return( HOME      );
                case _END:              return( END       );
                default:                return( NULL      );
                }
        }
        else if( c == '\r' )                    /* map ENTER key to '\n' */
        {
                return( '\n' );
        }
        else if( c == CNTL_C || c == CNTL_Z )
        {
                ateof = 1;
                return EOF;
        }
        else
                return c;

}

/*----------------------------------------------------------------------*/

ptail( bp, end, move )
```

```
register char   *bp, *end;
{
        /*      Print out all characters between bp and end (inclusive)
         *      without modifying the current cursor position. If move
         *      is zero the cursor will not change position, otherwise
         *      the cursor will be left pointing to the character
         *      referenced by end.
         */

        register short  posn;

        if( !move )
                posn = getcur();

        for( ;  *bp && bp <= end;   wchar(*bp++) )
                ;

        if( !move )
                setcur( posn ); /* put cursor under first character */
        else
                wchar('\b');    /* put cursor under last character  */
}

/*---------------------------------------------------------------------*/

char    *egets( start, bufsize )
char    *start;
{
        /*      Get a string with editing. If bufsize is wider than your
         *      screen, strange things will happen when you try to use
         *      the editing functions. If you access this function
         *      via fgetline() then it will input longer lines in 78
         *      character chunks and \<CR> can be used to extend a line.
         *
         *      ^H or BACKSPACE     Destructive backspace, close up
         *                          remainder of string to fill hole.
         *      LEFT   CURSOR       Non-destructive backspace
         *      RIGHT  CURSOR       Move right one character.
         *      ^LEFT  CURSOR       Left  to previous word or line start
         *      ^RIGHT CURSOR       Right to next word or line end
         *      HOME                Left edge of line
         *      END                 Right edge of line
         *      CR or LF            Terminate line.
         *      ^X                  Erase entire line but don't return.
         *      ESC                 Return a null string immediatly.
         *      DEL                 Delete a current cursor position and
         *                              close up to fill hole.
         *      Any printing character  Enter that char at cursor posn
         *      Anything else           Ring the bell.
         *
         *      The bell will also ring if you try to move the cursor
         *      past either the left or right edges of the buffer.
         *      Return a pointer to the end of string normally, return 0
         *      on EOF and return -1 when ESC is encountered.
         */

        register char   *bp;    /* Points at current cursor position    */
        register char   *end;   /* Points at largest possible cur pos.  */
        register char   *maxbp; /* Points at rightmost char on line     */
        register int    c ;     /* Current character.                   */
        short           home;   /* place to remember the leftmost cursor
                                 * position.
                                 */

        end     = start + (bufsize-1) ;
        *end--  = '\0' ;
        bp      = start;
        maxbp   = start;

        /*      Fill the entire buffer with spaces
         */

        home = getcur();                        /* Get the current cursor   */
                                                /* position.                */

        if( *bp )                               /* If the buffer isnt empty */
        {                                       /* print out its contents   */
                while( *bp )                    /* and set maxbp to point   */
                   wchar( *bp++ );              /* at the previous end of   */

                maxbp = bp;                     /* string.                  */
                setcur( home );
        }

        for( ; bp <= end ; *bp++ = ' ' )        /* and then fill the rest   */
                ;                               /* of it with spaces.       */

        bp = start;

        /*      bp points into the bufer at the current cursor location.
         *      end points at the righmost place that the cursor movement
         *      commands can get us. There is actually one more place
         *      in the buffer. Get the line:
         */

        while(  (c = getkey()) != '\n'  &&  c != EOF )
        {
                switch( c )
```

(Continued on next page)



Number One In Performance

Hard Disk Intelligent VCR Backup for AT/XT/PC

FEATURES

High speed microprocessor controlled backup (68008)
- Two channel interface
- Built in LAN channel
- Software control of most VCR functions including Fast Forward, Rewind, and auto backup using VCR timer capabilities
- Economical VHS or Beta formats

TLM Systems

4704 W. JENNIFER, SUITE 105 • FRESNO, CA 93711
209/276-2345

Circle **no. 174** on reader service card.

PRIME FEATURES

- Execute DOS level commands in HS/FORTH, or execute DOS and BIOS functions directly.
- Execute other programs under HS/FORTH supervision. (editors debuggers file managers etc)
- Use our editor or your own.
- Save environment any time as .COM or .EXE file.
- Eliminate headers, reclaim space without recompiling.
- Trace and decompile.
- Deferred definition, execution vectors, case, interrupt handlers.

HS/FORTH

- Full 8087 high level support. Full range transcendentals (tan sin cos arctan logs exponentials)
- Data type conversion and I/O parse/format to 18 digits plus exponent.
- Complete Assembler for 8088, 80186, and 8087.
- String functions - (LEFT RIGHT MID LOC COMP XCHG JOIN)
- Graphics & Music
- Includes Forth-79 and Forth-83
- File and/or Screen interfaces
- Segment Management
- Full megabyte - programs or data
- Fully Optimized & Tested for: IBM-PC XT AT and JR COMPAQ and TANDY 1000 & 2000 (Runs on all true MSDOS compatibles!)
- Compare
  BYTE Sieve Benchmark jan 83
  HS/FORTH 47 sec BASIC 2000 sec
  with AUTO-OPT 9 sec Assembler 5 sec
  other Forths (mostly 64k) 55-140 sec

FASTEST FORTH SYSTEM AVAILABLE.
TWICE AS FAST AS OTHER FULL MEGABYTE FORTHS!
(TEN TIMES FASTER WHEN USING AUTO-OPT!)

HS/FORTH, complete system only: $270.

Visa Mastercard

HARVARD SOFTWORKS

P.O. BOX 69
SPRINGBORO, OH 45066
(513) 748-0390

Circle no. 132 on reader service card.

C Chest

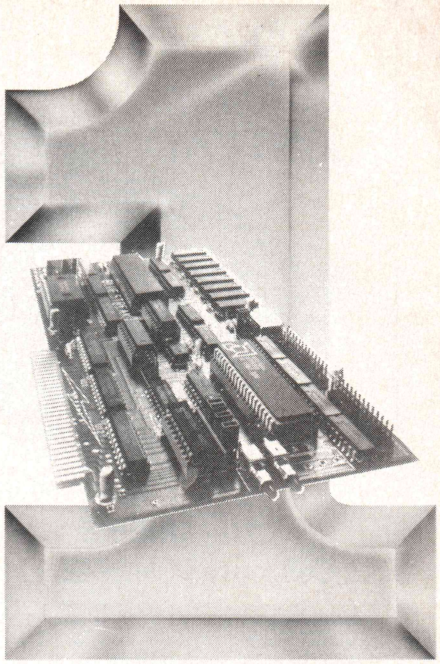
(Listing continued, text begins on page 16)

Listing Five

```
        {
        case LEFT:                  /* Non-destructive backspace     */

                if( bp > start )
                {
                        wchar( '\b' );
                        --bp;
                        break;
                }

                wchar( BEL );
                break;

        case '\b':                  /* Destructive backspace         */

                if( bp <= start )
                {
                        wchar( BEL );
                        break;
                }

                wchar( '\b' );
                --bp;

                /* fall through to delete case */


        case DEL:               /* Delete character and close up     */

                if( bp >= maxbp )       /* nothing to delete         */
                        break;

                movmem( bp+1, bp, maxbp-bp );
                *maxbp = ' ';
                ptail( bp, maxbp-- , 0);
                break;

        case CTL_LEFT:      /* Cursor to start of previous word */

                if( bp > start )
                {
                        do {
                                --bp;
                                wchar( '\b' );

                        } while( bp > start && *bp == ' ' );

                        while(   bp > start && *bp != ' ' )
                        {
                                --bp;
                                wchar( '\b' );
                        }

                        if( *bp == ' ' )
                                wchar( *bp++ );
                        break;
                }

                wchar( BEL );
                break;

        case HOME:                  /* Cursor to left extreme        */
                bp = start ;
                setcur( home );
                break;

        case ESC:                   /* Erase entire line and return */
                *start = 0;
                wchar( '\r' );
                wchar( '\n' );
                return -1 ;

        case CAN:                   /* Erase entire line             */
                setcur( home );
                for( bp = start; bp < maxbp; *bp++ = ' ')
                        wchar(' ');

                setcur( home );
                maxbp = bp = start;
                break;

        case RIGHT:                 /* Cursor right one character    */

                wchar( ( bp < end ) ? *bp++ : BEL );
                break;

        case CTL_RIGHT:             /* Advance to next word          */

                while( bp < maxbp  &&  *bp != ' ' )
                        wchar( *bp++ );

                while(  bp < maxbp  &&  *bp == ' ' )
```

```
                                wchar( *bp++ );

                        break;

                case END:               /* Go to right extremity  */

                        if( bp < maxbp )
                        {
                                ptail( bp, maxbp, 1 );
                                bp = maxbp ;
                        }
                        break;

                default:
                        /*      If we aren't at the right-most extreme
                         *      of the buffer, move the tail over to
                         *      make room for the current character,
                         *      else just print it.
                         */

                        if( bp <= end  &&  (' ' <= c  &&  c < 0x7f) )
                        {
                                if( bp < maxbp )
                                {
                                        if( maxbp < end )
                                                maxbp++ ;

                                        movmem( bp, bp+1, end-bp );
                                        ptail ( bp, maxbp, 0 );
                                }

                                wchar( c );

                                if( bp < end )
                                        *bp++ = c;
                                else
                                {                       /* we're at the  */
                                        wchar( '\b' );/* right margin   */
                                        wchar( BEL ); /* back up and    */
                                        *bp = c ;     /* ring the bell */
                                }

                                if( bp > maxbp )
                                        maxbp = bp;

                                break;
                        }

                        break;
                }
        }

        /*      Delete trailing whitespace, terminate the string, go
         *      to the next line, and return EOF if we're at end of
         *      file, the end pointer otherwise.
         */

        for( ; *end == ' ' && end >= start ; --end )
                ;

        *++end = '\0';
        wchar( '\r' );
        wchar( '\n' );

        return ( c == EOF  &&  start == end ) ? NULL : end ;
}

/*----------------------------------------------------------------------*/

char    *getl( buf, maxline, fp )
char    *buf;
FILE    *fp;
{
        /*      Works exactly like fgets but returns a pointer to the
         *      end of the string on success.
         */

        register int     c;
        register char    *bp = buf;

        while( (c = fgetc(fp)) != EOF  &&  c != '\n'  &&  --maxline > 0 )
                *bp++ = c;

        *bp = '\0' ;

        return( (c == EOF && bp == buf) ? NULL : bp );
}

/*----------------------------------------------------------------------*/

char    *efgets( buf, maxline, fp )
char    *buf ;
FILE    *fp  ;
{
        /*    An editing version of fgets.
         *    Works like fgets but recognizes a back-slash at end of line
         *    if fp is stdin then raw i/o is used and various editing
         *    functions are enabled (see egets for details). A pointer
```

(Continued on next page)



Number One in Performance

Z80H BLUE STREAK™

IBM/AT/XT/PC- 8mz
No Wait States

FEATURES

- 64K-256K RAM
- 2K-8K EPROM/Static Ram
- 2 Serial Ports
  Async/Sync/Bisync Communications
- Real Time Clock
- Memory-mapped Dual-port BUS
- On-board/Remote Reset NMi capability
- Up To 32 Boards Per AT/XT/PC
- Can Operate As Standalone Processor
- Less Than Full Size Board
  (will fit other compatables.)

SOFTWARE

- ZP/M tm CP/M Emulation Software
  (Supports Most CP/M Software)
- Multiuser Capability if Used As A
  Slave Processor

IBM is a registered trademark of International Business Machines
CPM/80 is a registered trademark of Digital Research Corp

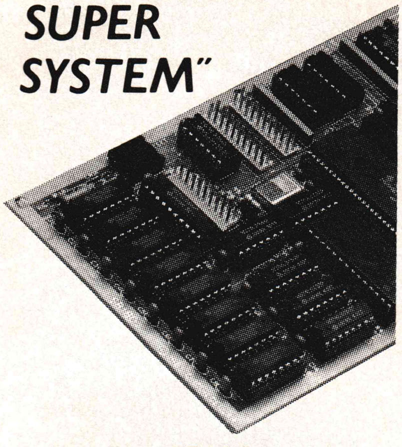
TLM Systems

4704 W. JENNIFER, SUITE 105 • FRESNO, CA 93711
209/276-2345

Circle no. 175 on reader service card.

Byte Magazine called it,

"CIARCIA'S SUPER SYSTEM"



The SB180 Computer/Controller

Featured on the cover of Byte, Sept. 1985, the SB180 lets CP/M users upgrade to a fast, 4" x 7½" single board system.

- **6MHz 64180 CPU**
  (Z80 instruction superset), 256K RAM, 8K Monitor ROM with device test, disk format, read/write.
- **Mini/Micro Floppy Controller**
  (1-4 drives, Single/Double Density, 1-2 sided, 40/77/80 track 3½", 5¼" and 8" drives).
- **Measures 4" x 7½", with mounting holes**
- **One Centronics Printer Port**
- **Two RS232C Serial Ports**
  (75-19,200 baud with console port auto-baud rate select).
- **Power Supply Requirements**
  +5V +/-5% @500 mA
  +12V +/- 20% @40mA
- **ZCPR3 (CP/M 2.2/3 compatible)**
- **Multiple disk formats supported**
- **Menu-based system customization**

SB180-1
SB180 computer board w/256K bytes RAM and ROM monitor **$369.00**

SB180-1-20
same as above w/ZCPR3, ZRDOS and BIOS source............ **$499.00**

-Quantity discounts available-

NEW
COMM180-M-S
optional peripheral board adds 1200 bps modem and SCSI hard disk interface.

TO ORDER
CALL TOLL FREE **1-800-635-3355**

TELEX **643331**

For technical assistance or to request a data sheet, call:
1-203-871-6170

MICRO MINT

Micromint, Inc.
25 Terrace Drive
Vernon, CT 06066

C Chest **(Listing continued, text begins on page 16)**

(Listing continued, text begins on page 16)

Listing Five

```
         *      to the end of the input string is returned on success or
         *      NULL on end of file.
         */

        register char   *bp, *start = buf ;
        int             linelen, col;

        if( fp == stdin )
        {
                /*  linelen is the amount of space left on the
                 *  current input line. Col is the column componant
                 *  of the current cursor position.
                 */

                linelen = 80 - (col = getcur() & 0xff);
        }
        while(1)
        {
                bp = (fp == stdin) ? egets( buf, min(linelen, maxline) )
                                   :  getl( buf, maxline, fp )
                                   ;

                /*      If egets() found and ESC (bp == -1) or we've
                 *      hit end of file (!bp) or we've seen a
                 *      blank line (bp == buf) the last character on the
                 *      line isn't a \, break; Note that in the first
                 *      case we erase then entire buffer.
                 */

                if( bp == -1 )
                {
                        *(bp = start) = '\0';
                        break;
                }
                else if( !bp  ||  bp <= buf  ||  *(bp-1) != '\\' )
                        break;

                /*      Adjust maxline to compensate for the characters
                 *      already gotten and decrement bp so that we'll
                 *      overwrite the \ on the next pass. Then, if
                 *      we're getting input from stdin, position the
                 *      cursor in its original column but on the current
                 *      line.
                 */

                maxline -= (--bp - buf);
                buf      = bp ;

                if( fp == stdin )
                        setcur( (getcur() & ~0xff) | col );
        }

        return( bp );
}

/*----------------------------------------------------------------------*/

#ifdef DEBUG

main()
{
        static char buf[80] ;

        printf("          1         2         3         4\n");
        printf("     1234567890123456789012345678901234567890\n");
        printf("     ");

        while( efgets(buf, 40, stdin)  >  0 )
        {
                printf("     %s<---\n\n", buf );
                printf("          1         2         3         4\n");
                printf("     1234567890123456789012345678901234567890\n");
                printf("     ");
                *buf = 0;
        }
}

#endif
```

End Listings

Mystic Pascal

Fastest Compiler on Earth—$64!

Mystic Pascal compiles at 100,000 to over 1,000,000 lines per minute! How? It takes a short cut called *incremental compilation.* Compared to earlier Pascals, the effective speed is astronomical. Give the Compile command for a 1000 line program, and you probably can't lift your finger from the keyboard before the compiler flashes—DONE!

640K of storage not 64K. Are you fed up with being forced to shoehorn your programs into 64K? You won't need mystical powers to run your program in the full 640K that we allow—code, data and stack.

Interactive Pascal. You can enter Pascal statements directly and see the results instantly. It works like a Basic interpreter but it's a true compiler!

Optimized 8086 Code. Mystic Pascal produces true 8086 object code. The TWO code optimizers run in the background so they don't slow you down. Thanks to another breakthrough, our software floating point arithmetic runs faster than Intel says is possible on the 8088/8086 chips.

Real Multi-Tasking Pascal. Advanced programmers may write truly concurrent Pascal programs by simply starting Pascal procedures. Up to 100 concurrent procedures can communicate by passing messages through queues.

ISO Standard Pascal. Educators in particular need a truly Standard Pascal for their students. And learning is made easier by the Help Windows which describe Pascal.

Mystic Canyon Software
P.O. Box 1010
Pecos, New Mexico 87552

Place your order by phone today—
(505) 757-6344 or mail the coupon.
Requires an IBM Personal Computer or true compatible with 256K. Not copy protected.

Rush me the Mystic Pascal System with diskette and 75 page manual!

Name ______________________

Address ______________________

City ______________ State ______________ Zip ______________

☐ Check/Money Order ☐ Visa ☐ Mastercard

Price is $64 total. CODs and Purchase Orders are NOT accepted.
Outside US & Canada add $15. Payment must be in US funds on a US bank.

Card ______________________ Exp. ______________

Signature ______________________

Circle **no. 79** on reader service card.

Windowing Operating Environments

TopView, GEM, and Windows

by Michael Swaine

What's really going on inside GEM, beneath TopView, behind Windows?

It's a good thing Bill Gates isn't thin-skinned. Otherwise he might take offense at the way so many programmers are spending so much time enhancing, augmenting, bypassing, subverting, taming, masking, and hiding MS DOS. And now Microsoft is getting into the act with Windows. This article examines Windows and two other "windowing, multitasking programming environments" for MS or PC DOS machines: IBM's TopView and DRI's GEM.

You could argue that the seeds were planted by no less a gardener than the Jolly Blue Giant when IBM released its PC with no operating system but with three operating system options: PC (a.k.a. MS) DOS; CP/M-86; and SofTech's UCSD p-System. Although IBM's subsequent pricing strategy strongly hinted that PC DOS was the PC's DOS, the other operating systems never entirely took the hint and went away. Nor did they even get humble: Consider NCI's recent ads for its p-System that announce a new release for the whole PC family (except for jr, whom the family never mentions). The ads, directed at programmers, suggest that with the p-System you can have compatibility with the operating system that your customers, in their ignorance, want (DOS), but can still work in a good programming environment (not DOS).

Although there were precursors, DRI should probably get the credit for bringing concurrent processing to personal computers with its concurrent version of CP/M. It soon became clear to DRI that to sell concurrency on IBM PCs it had to develop a concurrent PC DOS, acknowledging Microsoft's control of the PC operating system area. But DRI had raised the issue of concurrency on a single-user computer.

After DRI opened the concurrency window, there came the pop-ups, an undisciplined horde of dwarf programs that demonstrated even to ordinary mortals the benefits of some approximation of concurrency. They presented object lessons in the hazards of operating system anarchy as well. It was cute when Eastman Kodak put a package under the tree labeled "Open me first"; it was less appealing to confront a dozen software packages all clamoring "Load me first."

What allowed pop-ups to show off their concurrency was windows, an architectural feature opened by Xerox and polished by Apple. The success of the concept of windows is exemplified by its employment in dWindow, a non-operating system application. For years, Ashton-Tate's dBASE II set the standard for austerity in user interfaces—you can't get much simpler than a single period prompt. Liberty-Bell Software's dWindow does a dazzling cathedral window treatment on dBASE II and III that makes them look like entirely different products. But it is at the operating system level that the fenestration of the interface has become obligatory, and it was Apple's Macintosh that made it so.

Bill Gates and his Microsoft programmers were among the first developers to peek behind the blinds at Apple, and they were not slow to announce Microsoft's own window-oriented product, which they called Windows. Sometime between the announcement of Windows and its release, the Korean War ended, Alaska and Hawaii attained state-

hood, and Digital Research programmers conceived and brought out a windowing product called GEM, whose visual display, Apple recently noticed, looks rather like the Mac's. Meanwhile, IBM caught the drift, fumbled through its pockets, and pulled out a windowing, multitasking operating environment that it christened TopView.

With at least three windowing, multitasking operating environments to load on top of, stack next to, or wrap around DOS, the archetypal "fully loaded PC" was beginning to look like a pop-up on steroids. In fact, or at least in *PC Week*, Peter Norton described a dream he had in which he tried to run TopView, GEM, and Windows simultaneously. His hard disk flew to Poland.

Smart Money Talks a Lot

A programmer must face more serious questions of compatibility. How does each product work with DOS? How will existing and future programs run in each of these environments? How well will they run? What are the costs of laying another sheet of software between programmer and machine? We asked such questions of development-team members for each of the three products. But as the answers came back, industry analyses were circulating that questioned the viability of at least two of the products (the two that had actually been released). Were we wasting our time asking questions about these products?

Although some developers are producing TopView-compatible applications, the product has clearly not captured the imagination of users or developers. The recent agreement between IBM and Microsoft has fueled much speculation about the viability of TopView, and many observers seem to be betting on Microsoft. One popular argument is that IBM will create two systems: one using Windows and Microsoft's DOS, the other using a DOS-free descendant or unrelated successor to TopView—in any case, a proprietary operating system. Some, including IBM watcher Andy Seybold, speculate that the IBM-Microsoft agreement may have little to do with IBM's long-term goals and that IBM will use TopView as the centerpiece of its future operating systems. At least one analyst insists that IBM's history demonstrates that it will eventually have a proprietary operating system on the PC. But IBM has broken tradition several times in the short history of the PC, and the venerable wisdom about what IBM always does may not be as wise now as once it was. It does seem that it is getting harder to second-guess IBM, and that the benefits from succeeding therein may be even more dubious today than in mainframe days.

The smart money is writing off GEM in the IBM-compatible market, reasoning that if IBM owns the hardware and Microsoft owns DOS, where does that leave a company that tries to compete with them on their turf?

Perhaps DRI's success with GEM will have to come in the other end of the dumbbell. Lee Felsenstein, in proselytizing for his Hacker's Mac project, describes the personal computer market as an asymmetric dumbbell with one globe of IBM-compatibles and a smaller globe of Macalikes. He argues that the smaller globe can grow and prosper only with compatibility and proposes a radical strategy for forcing compatibility on unwilling Apple, Commodore, and Atari. Such a development would likely benefit DRI and GEM, but is it likely?

Perhaps not, given the fact that Apple has pressured DRI into changing GEM to decrease its similarity to the Macintosh's visual interface. GEM as originally released had to be terminated by November 15, that is, DRI had to stop supporting and advertising it. The new version will look less Macintoshish. Apple is also talking with Microsoft about Windows, but in softer tones.

Smart money and dream-machine designers aside, GEM provides MS DOS users and programmers with capabilities that Windows and TopView lack. But TopView and Windows have their own distinct, desirable features.

Three facts argue against accepting the judgment of the smart money too hastily. First, the three operating environments offer three different sets of capabilities to users and software developers. Second, no one needs any of these products; they are all frosting on the DOS, and users may decide among them—or against all of them—on grounds that smart money would consider dumb. Third, as Bob Frankston pointed out in *InfoWorld*, writing for TopView (or Windows or GEM) limits your market. In any case, we assume there is merit in understanding these products from a programmer's point of view.

Inside GEM

At one level, getting started developing an application that is compatible with GEM is simple. You get the Programmer's Toolkit and start writing. In terms of hardware, you need a PC with half a megabyte of memory and a color-graphics adapter. You should also have a hard disk and a mouse, although you can do development work without them.

Beyond these elementary requirements, one comes up against the fact that GEM is a message-passing program. Years of single-thread procedural programming experience will not prepare you adequately for the different programming model that GEM employs. According to one GEM programmer, the learning curve within DRI during GEM development was two months. Programmers who had never worked with any windowing system took two months to get up to speed in the GEM programming environment. Programmers who had had some windowing experience learned faster but had to unlearn some details that did not transfer.

GEM itself does not communicate directly with DOS; that is, the Virtual Device Interface and Window Services don't. The GEM Desktop does. File manipulation is handled through DOS calls. GEM supports a variety of devices and is expected to support the AST/Ashton-Tate/DRI/Quadram expanded-memory specification, which will become particularly significant when the multitasking version of GEM is released.

GEM compares more directly with Windows than with TopView; TopView is character-oriented and truly multitasking and GEM and Windows are neither. In comparing GEM and Windows as programming environments, Windows developers point to powerful features, and GEM de-

velopers talk about a clean programmer's interface. But the clearest advantages GEM has over Windows at the moment seem to be that GEM has been out long enough to land significant committed and producing OEMs, including Atari and Apricot, and the leverage that this gives the developer in porting an application to different environments.

What does the Apple-DRI settlement mean to programmers who have developed GEM-compatible software or who are thinking about doing so? Perhaps not much. The changes in GEM forced by Apple appear to be essentially cosmetic, and though the impact on the GEM Desktop will be significant, the programming impact may be minimal.

Beneath TopView

The chief difference between TopView on the one hand and GEM and Windows on the other is that TopView is truly multitasking. You can see multitasking in action if you bring up a visually active BASICA program in two TopView windows simultaneously. You'll see the program doing its thing in parallel with itself.

Because it is a multitasking operating environment, TopView permits the development of multitasking applications. The application developer can produce a task with its own subtasks. Then, in addition to running the application in multitasking mode with other tasks, TopView will multitask the application's subtasks. Tasks can communicate; if you get the object handle for a task you can send it a message.

Memory management under TopView is as simple as it is under DOS. When a program begins, it is assigned memory according to the demands of its fixed Program Information File. Henceforth it can get no more nor less. On a program's termination, its memory is freed.

TopView does not replace DOS. It sits atop DOS, handing off file I/O and other system functions to the system. It is at the character I/O level that TopView butts in, redirecting all character I/O. Among other things, this means that you can freely mix TopView and DOS calls. You can put the user in DOS under TopView and have the fact that TopView is active be unknown to them. (A Getversion call will show the user that TopView is active.)

Although TopView is character-oriented rather than graphics-oriented, it will work with a standard monochrome or color screen and anything up to the EGA. TopView will work with the EGA but won't take advantage of its extended graphics capabilities.

TopView developers are trying to woo other developers, arguing that you can bring a more powerful application to market more quickly if you write for the TopView environment—you can take advantage of a standardized display style, a toolkit of window design aids, and other development tools. You can also use what TopView designers call full-screen input. This wooing of developers has not been entirely unsuccessful; the Trio micro-to-mainframe product and the Lattice Topview Toolbasket are significant TopView-compatible products.

For existing programs, you can make use of as much of the windowing capability as makes sense. For some applications this may be useless, but the capability is there. The implementation of DOS services shows what IBM projects for future applications—making logical use of several windows rather than just throwing a frame around a full-screen display.

Behind Windows

Because Microsoft has good sources on what future versions of DOS will require, its programmers can do what they admonish independent developers not to do—work around DOS. Windows runs "side by side with DOS." When Windows comes up, its DOS executive replaces command.com, which is no longer needed.

Windows is made up of three pieces: two are the external pieces that everyone sees, the user interface and the graphics device interface (GDI). The third is the kernel, which interfaces to whatever kind of MS DOS is on the machine. This interface changes considerably with different versions of DOS and hides the operating environment from Windows.

The user interface differs from the Mac/GEM/TopView approach in tiling the screen with windows that don't overlap other windows.

At the GDI level is an interrogating interface: if a device says that it can only do bitblt, the interface will simulate everything else in the software using bitblt; if the device says it can do complex polygons with hash filling, GDI hands off to the device. The device manufacturer fills in capabilities up to some level and Windows simulates the rest. The goal at the GDI level was device independence—the ability to change one line of code and have output go to a different device.

At the level of the kernel, Windows has true compacting global memory management; it does not have true preemptive multitasking. It can allocate, reallocate, dynamically free and restore data. Its task handling is round robin nonpreemptive multitasking—the application must yield control. There are mechanisms for implicit yielding when the application is waiting for something.

The reason Microsoft gives for not implementing true preemptive multitasking is suggestive: DOS is not reentrant. If you preempt a task and it's in DOS at the time, you'd best get back to DOS quickly. So a good chunk of the time slicing would not be beneficial. That, Windows developers claim, is why TopView is slow. Rick Dill of the Windows design team says, "We think multitasking really belongs at the operating system level, and it will get there eventually." He means in MS DOS.

Windows started from the Smalltalk push model and changed to a more procedural approach only when Microsoft found that programmers didn't work well with its implementation of the push model. The general structure of a Windows application is: initialization; Windows-required initializations (because Windows does not require that an application be installed it does require that the application register itself with Windows when it starts); creating a window; and the main program while loop—Getmessage, Translatemessage, Dispatchmessage.

One of the hidden features is the ability for applications

Combine The Power Of C And Your IBM Mainframe

What are the advantages of running C on your 370?

C is a high level language offering speed, power and flexibility. When you combine this with the IBM 370, you've got an unbeatable environment for software development. In addition, C lends itself to many different types of applications, is highly portable to a number of diverse CPU architectures and is the basis for a wide variety of existing software. Clearly, the future of programming lies with C.

Why Choose Whitesmiths' C?

Experience. Whitesmiths has been developing C compilers for over seven years. We were one of the first to introduce C for the 370 and our experience is evident in the features we offer:

- Full implementation of the C programming language for the IBM 370
- Ability to run under VM/CMS and MVS, and to run interactively under TSO
- Ability to produce re-entrant code (discontiguous shared segments)
- Direct support for both EBCDIC and ASCII character sets
- Optional cross support for MS/PC-DOS, CP/M-86, CP/M-68K, VERSAdos-68K and CP/M-80
- Unlimited use of libraries in binary form
- Support for ROM-based programs
- UNIX-style compatible library
- Optional use of IBM or Whitesmiths assembler
- Support of full ISO Level 0 Pascal, extended to support separate compilation
- System and Machine Interface Libraries provided in source code form

Call Whitesmiths' toll-free number for more information
1-800-225-1030

INTERNATIONAL DISTRIBUTORS: UNITED KINGDOM - Real Time Systems, Ltd., Douglas, Isle of Man, 011-44-0624-26021; AUSTRALIA - Neology Pty. Ltd., Rosebury, Sydney 662-4111; JAPAN - Advanced Data Controls Corp, Toshima-Ku, Tokyo, 03-576-5351; SWEDEN - Unisoft AB, Goteborg, 011-46-31-125810; FRANCE - Cosmic SARL, Paris, 011-33-378-8357

Whitesmiths, Ltd. ◆ 97 Lowell Road ◆ Concord, MA 01742 ◆ 617-369-8499 ◆ Telex 750246

Circle **no. 156** on reader service card.

New C Tools

***SPECIAL OFFER $349**
UniTools, "Z," PC-LINT and Sunscreen.

UniTools ~~$149~~ **$99**
MAKE, DIFF and GREP
These versatile UNIX utilities put power at your fingertips. MAKE, a program administrative tool, is like having an assistant programmer at your side. DIFF compares files and shows you the differences between them. GREP can search one or many files looking for one pattern or a host of patterns.

"Z" ~~$149~~ **$99**
A Powerful "vi"-type Editor
Based on the Berkeley "vi" editor, "Z's" commands are flexible, terse, and powerful; macro functions give you unlimited range. Features include "undo," sophisticated search and replace functions, automatic indentation, C-tags, and much, much more.

SunScreen ~~$149~~ **$99**
Low-priced screen utility
Create and modify formatted screens easily. Validate fields, support function keys, color and monochrome cards. With library source SunScreen is $199.

PC-LINT ~~$149~~ **$99**
Error checking utility
A LINT-like utility that analyzes programs and uncovers bugs, quirks and inconsistencies. Detects subtle errors. Supports large and small memory models, has clear error messages and executives quickly. Has lots of options and features that you wouldn't expect at this low price.

The support products listed here run with most leading MS/DOS and PC/DOS C compiler systems, including **Manx Aztec,** Lattice, Microsoft, Mark Williams and Computer Innovations C.

Learn C Today!

C' PRIME $99

***INTRODUCTORY OFFER! $99**
C' Prime, Personal Computing and C, Plus APPRENTICE C

Never has C been easier to learn. **Manx Aztec** is now offering a complete C system called **C' Prime** at an exceptionally low price. This powerful system includes a Compiler, Linker, Assembler, Editor, Libraries and Object Librarian. **C' Prime** has full UNIX compatability, and supports a host of third-party software.

NEW FROM ASHTON-TATE!

A Practical Step-by-Step Introduction to C Programming written Especially for use with Manx Aztec's new C' Prime:

Personal Computing and C, is a detailed, easy-to-understand guide to C prepared especially by Ashton-Tate for use with the new **Aztec C' Prime.** Written by John Gainsborough of NASA's Jet Propulsion Laboratory, it includes chapters on C programming basics, function libraries, data handling, and many other functions. The book also includes a complete demonstration program of an accounting database update application, as well as dozens of examples on how you can program effectively with C.

APPRENTICE C
Learn C with this easy to use, and complete C language interpreter. APPRENTICE C includes a complete one-step compiler that executes with lightning speed, an editor, and a run-time system. **$49.95**

Tools for C

C Utility Library ~~$185~~ **$135**
Over 300 C subroutines
C and assembler source code for screen handling, color printing, graphics, DOS disk and file functions, memory management and peripherals control. Graphics and speed are impressive.

C-tree ~~$395~~ **$309**
B-Tree database system
Store, update and retrieve records easily. Both high-level multi-key ISAM routines and low-level B-Tree functions. Available for MS-DOS, CP/M-86, CP/M-80 and others. Easily transported. Adaptable for network and multiuser. Includes source.

PHACT ~~$250~~ **$200**
Data Base Record Manager
Includes high-level features usually found in larger database systems. Tunable for speed or size optimization. Available for MS-DOS, CP/M-86 and CP/M-80.

Pre-C ~~$395~~ **$315**
LINT-like source code analyzer
Locates structural and usage errors. Cross-checks multiple files for bad parameter declarations and other interface errors.

Windows for C ~~$195~~ **$159**
Versatile window utility
Supports IBM PC and some non-compatible environments.

PANEL ~~$295~~ **$235**
Screen generating utility
Create screens via simple, powerful editing commands. Select colors, sizes and types, edit fields. Directly input data to a multi-keyed file utility, and tailor screens for each application.

HALO ~~$250~~ **$199**
Ultimate C graphics
A comprehensive package of graphics subroutines for C. Supports multiple graphics cards.

PLINK-86 ~~$395~~ **$319**
Overlay linker
Includes linkage editor, overlay management, a library manager and memory mapping. Works with Microsoft and Intel object.

To order or for information call:

TECWARE 1-800-TEC-WARE

(In NJ call 201-530-6307)

Circle no. 109 on reader service card.

written by different vendors to be integrated via cut and paste as well as the via the messaging mechanism. For example, Multiplan could register a message that says "cell changed." A presentation-graphics program could know that that message means it can look in the clipboard for the contents of the cell and automatically update the chart being displayed.

Windows is 85 percent written in C; the low-level part is written in assembly. Windows supports Pascal, FORTRAN, C, or Microsoft's macro assembler. Because of the new .exe format, programmers will have to use Microsoft's new linker.

According to Dill, Microsoft hopes to entice software developers with the knowledge that, in conforming with Windows, they're building a future DOS-conforming application. Windows is a sneak peek into DOS. (On the other hand, Dill admits there are software developers who have disassembled the .exe file and know more about the innards of DOS than he does.)

But does all this just get in the software developer's way? Most serious software developers find that they must work around DOS to produce a competitive product. Won't software developers find Windows just as encumbering?

"Our bitblt," Dill responds, "is faster than yours." He's serious: Microsoft's bitblt is a general-purpose source-pattern-destination function supporting four operators. The result is that there are 256 different operations available: others implement some subset, often 16, of those. The Windows graphics routines can move a graphics block around the screen almost as fast as the data can be moved through memory. Whether that answers the question is moot.

One significant change Microsoft is introducing is a new .exe file format. Future versions of DOS (of which Windows is a hint) will need more information in the .exe file. To maintain some compatibility, Microsoft has grafted the old .exe header, code, and data on top of the new .exe header. The old tells where the new begins, and the new has its own code and data. It also has something totally new called resources. Resources (like menus and dialogue boxes) can be changed without messing with the .exe file. Thus, one can have one binary that works worldwide, with the resources supplying the language-specific information.

What, then, of the .com files? In the next version of DOS, .com files go away. DOS 3 is the last Microsoft operating system in which memory-image programs will be supported under the operating system itself. "We just need the information," Dill explains, "to be able to do things like running that application up in high memory and being able to segment it correctly and deal with running an old style 8088 unprotected application under a 286." DDJ

Reader Ballot
Vote for your favorite feature/article.
Circle Reader Service **No. 192.**

MORE... VALUE and PERFORMANCE *with Mitek's* Relocatable Z80 Macro Assembler and Z80 Symbolic Debugger

NEW
Z80 Symbolic Debugger

- Only $49.95 plus shipping.
- Screen oriented with a simultaneous display of instruction mnemonics, register, stack, and memory values.
- Breakpoints may be set on any combination of fixed memory address, register values and/or memory values.
- Uses Digital Research compatible SYM files.
- Supports Hitachi HD64180.

Relocatable Z80 Macro Assembler

- Only $49.95 plus shipping.
- 8080 to Z80 Source Code Converter.
- Generates Microsoft compatible REL files or INTEL compatible hex files.
- Compatible with Digital Research macro assemblers MAC & RMAC.
- Generates Digital Research compatible SYM files.
- Conditional assembly.
- Phase/dephase.
- Cross-reference generation.
- Full Zilog mnemonics.
- INCLUDE and MACLIB FILES.
- Separate data, program, common, and absolute program spaces.
- Supports Hitachi HD64180.
- Z80 Linker and Library Manager for Microsoft compatible REL files available as an add-on to Assembler.

ATTENTION Turbo Pascal Users:
Assembler will generate Turbo Pascal in-line machine code include files.

TO ORDER, CALL TOLL FREE: 1-800-367-5134, ext. 804
For information or technical assistance: (808) 623-6361

Specify desired 5¼" or 8" format. Personal check, cashier's check, money order, VISA, MC, or COD welcomed.

P. O. Box 2151
Honolulu, HI 96805
MITEK

PRICE LIST
Z80 Macro Assembler: $49.95
Assembler, Linker, and Library Manager: $95.00
Manual Only: $15.00
Z80 Symbolic Debugger: $49.95
Manual Only: $15.00
Assembler, Linker, Library Manager, and Debugger: $134.95
Include $5 for shipping and handling.

Z80 is a trademark of Zilog, Inc. MAC and RMAC are trademarks of Digital Research, Inc. Turbo Pascal is a trademark of Borland International, Inc.

Circle **no. 71** on reader service card.

BANKSWAP

A Banked Memory Debugging Tool for CP/M Plus

by Albert S. Woodhull

By making extended memory useful to 8-bit processors, CP/M Plus can help to keep 8080-, 8085-, and Z80-based microcomputers in competition with newer 16-bit systems. Although the 8-bit processors can directly address only 64K of memory, under CP/M Plus a megabyte can be efficiently used.

For the programmer there is a catch. Transient programs must reside in a single 64K bank. They have indirect access to alternate banks through the operating system. A user running purchased software will not be bothered by this. Developers and others who need to write or modify code that uses the alternate banks have a serious problem, however. CP/M Plus comes with development tools, such as the RMAC assembler and LINK, that enable one to write code for use in any bank of memory, but the standard CP/M Plus debugging tool, SID, is an ordinary transient program, incapable of examining or changing the alternate banks. The programmer needs new tools or a way to extend the power of the old ones.

My response to this need was BANKSWAP, an extension for SID or DDT that provides access to the alternate banks. I will describe this tool after a brief discussion of how CP/M Plus uses banked memory.

Banked Memory in CP/M Plus

Additional banks of memory can improve the speed and memory availability for a user program even though the program resides entirely in the main bank. The speed increase comes from using the extra memory to buffer disk data and disk directories. The space increase comes from putting part of the operating system in an alternate memory bank, making almost all of the 64K of memory the processor can address available to the user's program. For instance, on an Apple with the Advanced Logic Systems CP/M Card the transient program area (TPA) is 60K, even though the CP/M Plus system itself (exclusive of the CCP) takes up 17K.

User programs cannot directly access data or executable code in alternate banks. The point can be argued, but I believe Digital Research made a wise choice in imposing these restrictions. Most programs that use a lot of memory use it to hold data, and disk buffering can provide an improvement in data access comparable to that of extended memory. Given the inherent limitations of 8-bit processors, it is not clear that allowing user programs to execute code resident in extended memory would be much more efficient than using code overlays swapped in from disk buffers.

Under CP/M Plus, programs must be written as if the extra memory is not there at all. As long as the minimum amount of memory needed for an application is present in the TPA bank, a program will be able to run on any CP/M system. This continues the CP/M tradition of providing portability for programs by using the operating system to make details of hardware irrelevant to user programs.

Apple's Filer is fine until you want to copy files between volumes without losing a BASIC program in memory.

Albert S. Woodhull, Hampshire College, Amherst, MA 01002

The BANKSWAP Program

BANKSWAP is not a stand-alone program; it is an enhancement to SID or DDT that provides additional commands to copy blocks of memory from bank to bank. The normal functions of the debugger can be used on a copy of memory from another bank that has been brought to the TPA bank.

BANKSWAP is relocatable and is not necessarily loaded to the same location each time it is used. For ease of use, BANKSWAP installs a vector to its own entry point at the RST 5 location (28H) during installation. Typing G28 from the SID or DDT prompt brings up the BANKSWAP menu. The initialization process also displays a message to remind the user of the presence of BANKSWAP and the command to access it.

The BANKSWAP menu allows the user to choose the direction of the move, the memory addresses for the source and destination, and the length of the block to be moved. The menu also provides for easy return to DDT or SID and for the eventual removal of BANKSWAP. Copying is done in two steps through a buffer that is also in common memory. I chose to use a relatively small buffer and repeat the process several times in order to make the best use of memory space.

Listing One (page 38) for BANKSWAP.ASM contains comments that explain the operation of BANKSWAP, but I will emphasize a few points I found important in working with banked memory. Although I wrote this program for use on an Apple with the Advanced Logic Systems CP/M Card, there should be no problems in making BANKSWAP work on other implementations of CP/M Plus. The most critical point is to be sure that control is not lost while bank 1 is deselected. This means ensuring that BANKSWAP itself, the stack, and all data areas used are located in common memory. It is possible for a CP/M Plus system to be constructed so that interrupts and system calls can be handled while alternate banks are selected. With insurance in mind, I thought it best to disable interrupts and avoid calls to the standard BDOS entry point while bank 1 is deselected because the vectors on page 0 of bank 1 are then inaccessible.

I used a direct call to a BIOS routine to select the bank of memory. There are several points to mention in regard to that. First, the CP/M Plus documentation is emphatic in stating that direct BIOS calls must not be made by application programs; the reason for this is that under CP/M Plus some BIOS routines are always called from the bank 0 portion of the BDOS and will not return to a program located in bank 1. In fact, a separate BDOS function is provided for gaining direct access to the BIOS. The catch is that this BDOS function prohibits access to one BIOS routine—you guessed it—the one we need for BANKSWAP. Digital Research really doesn't want user programs to try to access other memory banks.

Having decided to take the law into your own hands and call the BIOS bank-select routine directly, you can't do it by accessing the BIOS vector in low memory just any old time for the same reason you can't use BDOS routines any old time—some of the time the low memory the program sees will be in bank 0. For

If you use an IBM PC, you're stuck with DOS.

But that doesn't mean you have to develop under DOS. Everybody knows that IBM and DOS go together like the old-fashioned horse and carriage. Like it or not, DOS dominates the PC market and until now, developers have just had to grin and bear it.

But now you have a choice. *NCI's UCSD p-System is a powerful solution* for the developer who requires an outstanding development environment but wants to retain compatibility with DOS. The UCSD p-System supports the full range of ANSI Standard Pascal instructions, plus several valuable extensions. It supports large libraries of separately compiled modules and code overlays, so that you can develop larger programs than ever before, as well as a wealth of development tools including a full-screen editor, a file manager, a library manager, full interrupt serial support, TurtleGraphics, automatic startup file, and many other software utilities. At the same time, you can send out your application on a DOS diskette, boot from DOS, use DOS hard disk partitions and automatically read from and write to DOS files.

So if you want a development environment that gives you speed, flexibility, efficiency, provides truly incredible programming capability, yet still gives your end-user the familiarity of DOS, choose *NCI's UCSD p-System -- the powerful solution.*

Order your p-System solution today: call (604) 430-3466.

NCI

Network Consulting Inc.
#115-3700 Gilmore Way, Burnaby, BC, Canada V5G 4M1
US Mailing Address: P.O. Box 8040, Blaine, WA 98230

Circle **no. 168** on reader service card.

this reason, I made the initialization portion of BANKSWAP fetch the BIOS vector so the necessary entry point could be calculated and stored locally. I did this only for the BIOS SELMEM routine; the program can be simplified if a BIOS XMOVE routine has also been implemented (this is not provided in the Advanced Logic Systems release of CP/M Plus).

Resident System Extensions

BANKSWAP must run in common memory. This is most easily accomplished by creating a relocatable file to be loaded to the top of the TPA. CP/M Plus has another feature, the Resident System Extension (RSX), to simplify this task.

An RSX is a page-relocatable program segment that CP/M Plus loads to the highest available address, just as DDT or SID are handled under older versions of CP/M. Each RSX module has a prefix, as shown in Listing One. The prefix includes a jump to the BDOS entry point in high memory (for the first RSX installed) or to the last previously installed RSX. Whenever an RSX is installed, the JMP instruction at location 5 is modified to point to it, so a chain of JMPs is traversed whenever a BDOS call is made. The address portion of the JMP at location 5 is also used by programs to detect the decreased size of the TPA, protecting the RSX from being overwritten.

Because all BDOS calls pass through the RSX JMP chain, RSXs can be written to intercept BDOS calls to customize BDOS performance. BDOS interception is not necessary, however. BANKSWAP intercepts only the very first BDOS call after it is loaded—this is a convenient way to force execution of the BANKSWAP initialization phase. The initialization code saves and restores whatever information is being passed to the BDOS and modifies the JMP chain to prevent reinitialization.

An RSX must be connected to a normal .COM program to be installed. CP/M Plus provides a utility, called GENCOM, to do this and also provides the RMAC and LINK programs needed to produce the relocatable program and its relocation bit map. The process is considerably more complicated than assembling and loading a program under CP/M 2, but it is easy to use the CP/M SUBMIT program to direct the process. An RSX can be attached to any .COM file. I have attached BANKSWAP to DDT.COM and SID.COM and it works with both. Listing Two (page 52) shows the RSXMAKER.SUB file that can create BANKSWAP.RSX and connect it to SID.COM.

When BANKSWAP is to be attached to SID or DDT it is assembled with a REMOVE flag set in the RSX prefix. This ensures that when a warm boot occurs upon exiting from SID the space occupied by the RSX will be freed. BANKSWAP can also be assembled to be loaded independently of SID by setting the ALONE equate true. In this case it is still necessary to attach the RSX code to a .COM file, which could be nothing more than a jump to location zero. As the Listing One shows, setting ALONE true resets the REMOVE flag in the RSX header, and it also adds an option to the BANKSWAP menu to allow later removal.

New Release

C + C UTILITY LIBRARY = PRODUCT

• We have over 300 complete, tested, and, documented functions. All source code and demo programs are included.

• The library was specifically designed for software development on the IBM PC, XT, AT and compatibles. There are no royalties.

• Over 95% of the source code is written in C. Experienced programmers can easily "customize" functions. Novices can learn from the thorough comments.

We already have the functions you are about to write

Concentrate on software development—not writing functions.

THE C UTILITY LIBRARY includes:
• Best Screen Handling Available • Windows • Full Set of Color Graphics Functions • Better String Handling Than Basic • DOS Directory and File Management • Execute Programs, DOS Commands and Batch Files • Complete Keyboard Control • Extensive Time Date Processing • Polled ASYNC Communications • General DOS BIOS gate • Data Entry • And More •

• The Library is compatible with: Lattice, Microsoft, Computer Innovations, Mark Williams and DeSmet. Available Soon: Digital Research, Aztec and Wizard.

C Compilers: Lattice C—$349. Computer Innovations C86—$329; Mark Williams C—$449.

C UTILITY LIBRARY $185. Special prices on library & compiler packages.

Order direct or through your dealer. Specify compiler when ordering. Add $4.00 shipping for UPS ground, $7.00 for UPS 2-day service. NJ residents add 6% sales tax. Master Card, Visa, check or P.O.

ESI
ESSENTIAL SOFTWARE, INC
P.O. Box 1003 Maplewood, New Jersey 07040 914 762-6605

Circle no. 138 on reader service card.

There is a potential problem with the version of BANKSWAP shown in Listing One, but I'm leaving it for someone else to fix. As noted above, BANKSWAP uses the RSX technique in order to be located at the highest available memory address. The actual amount of high memory that is common depends upon the hardware used, and I didn't figure out a way for a program to determine this. If too many RSXs are installed, the top of available memory can be below the common region. In this case BANKSWAP will probably cause a crash. On my Rev. A CP/M card the common-memory limit is at 8000H, which leaves room for a lot of RSXs, so I have never given the problem a high priority.

Using BANKSWAP

Once BANKSWAP has been attached to a copy of SID.COM it will be installed whenever SID is run. Listing Three (page 52) shows part of a typical session with enhanced SID. The initialization process tells the operator that BANKSWAP is available. A G28 command enters BANKSWAP, which displays a menu. I usually bring part of an alternate bank over to bank 1 first, then return to the debugger to examine, disassemble, or alter the copy. In fact, if executable code from some portion of bank 0 is brought over to the corresponding address range in bank 1 the debugger can be used to trace through it—providing that the code doesn't switch banks or access I/O or storage addresses in an alternate bank.

In the Apple environment there is one limitation: an Apple's I/O is all memory mapped in bank 0. If an attempt is made to access bank 0 in the range 6000H to 67FFH it may crash the system because some addresses in this range activate switches on the Apple main board or peripheral cards, including the CP/M Card itself.

Conclusion

One of my first reactions to CP/M Plus was a helpless feeling. I had written my own BIOS for CP/M 2.2 on my S-100 system, and I was accustomed to being able to explore how the system worked on any CP/M machine. With CP/M Plus, portions of the operating system were totally inaccessible to the tools I had on hand.

Most users don't need the kind of access I wanted. However, the initial version of CP/M Plus I received did not support my printer interface properly. I also had proposed to develop CP/M Plus driver software for companies that manufactured large-format disks and RAM-disk add-ons for Apples. The usability of my system as well as potential income depended upon my ability to patch various devices into CP/M Plus.

BANKSWAP solved my problems. It gave me a way to satisfy my curiosity about how the Advanced Logic Systems CP/M Plus BIOS worked, and I was able to figure out how to patch some of my peripheral drivers into CP/M Plus. Finally, I now had the tool I needed to begin to develop and debug enhancements to the supplied BIOS. In the process of developing BANKSWAP I also learned how to create and use RSXs, which are very useful CP/M Plus features.

DDJ

(Listing begins on next page)

Reader Ballot
Vote for your favorite feature/article.
Circle Reader Service **No. 193.**

DEBUG FAST!

As a professional, your time is valuable. Advanced Trace86™ is designed as a debugging environment to increase productivity. In many situations, Advanced Trace 86™ can pay for itself in one or two debugging sessions.

Advanced Trace86™

FEATURES

- Trace Screen with user-configurable windows for disassembled code, registers, flags, the stack, the 8087 registers, and memory.
- Single-step tracing with virtually unlimited **back tracing.**
- In-line assembly capabilities, edit .EXE and .COM files in memory (including non-destructive line insertion for .COM files).
- Symbolic debugging capabilities - read or create line labels and comments, read variables.

Debugger Comparison Chart - Selected Features

Features	AT86	Code.	Per.
1. Load Program as memory resident (like Sidekick)	X		X
2. IBM Professional DEBUG & Periscope boards supported	X		X
3. Keyboard break-out support - Ctrl-Enter key combo	X	X	
4. Conditional breakpoints	X		X
5. Hex/Decimal calculator & converter	X		X
6. Convert numbers to binary	X		
7. ASCII chart (pop up)	X		
8. In-line Assembler with code insertion capability	X	X	
9. 80286/80287 support in Assembler/Disassember	X		
10. Protect Virtual Mode Support for 80286	X		
11. 8087/80287 window - registers in both decimal & hex	X		
12. Display memory in ASCII, byte, word, & double word	X		X
13. Define "memory structures" for display/editing	X		
14. Try out DOS interrupts command	X		
15. Pop-up Help windows	X		
16. Command macros defined & saved to disk	X		
17. DOS TYPE, DIR, & ERASE commands	X		
18. Search memory for Assembler code - multiple instructions	X		
19. Execute/trace program in reverse & restore machine state	X		

AT86 - Advanced Trace86 Code. - Codesmith Per. - Periscope

Requires: IBM PC or compatible, minimum 128K RAM. Retail Price - $175.00

Morgan Computing Co., Inc.
P.O. Box 112730 Carrollton, Texas 75011 (214) 245-4763

Circle no. 128 on reader service card.

BANKSWAP (Text begins on page 34)

Listing One

```
                ; BANKSWAP.ASM
                ;
                ; A. S. Woodhull          28 June 83
                ; rev    1 July 85        -- minor editing
                ;       20 Oct 83
                ;
                ; This is designed to be run as a subprogram under DDT
                ; or SID, in a banked version of CP/M 3.0  The function
                ; of BANKSWAP is to copy blocks of memory from other
                ; banks to and from bank 1, using a buffer in the common
                ; area.  Normal DDT or SID functions can then be
                ; performed, using the copy of the code in bank 1.
                ; (Of course, you cannot trace through program segments
                ; that switch banks or access memory mapped I/O in
                ; another bank.)
                ;
                ; BANKSWAP must reside in the common area of memory, and
                ; a buffer area through which data can be copied must
                ; also be present in the common area.  BANKSWAP is to be
                ; assembled as a Resident System Extension (RSX), which
                ; will automatically be relocated to the top of the TPA.
                ; It is assumed that the common area is large enough to
                ; allow an RSX to fit--if this is not true BANKSWAP will
                ; not work in its present form.
                ;
                ; Because the location of BANKSWAP in memory is not fixed
                ; a jump through a fixed location is set up when the BANK-
                ; SWAP code is installed.  In this version the  RST 5 vector
                ; at 28H is used, but any convenient location on page zero
                ; may be used.
                ;
                ; Under CP/M 3 direct access of BIOS routines is generally
                ; to be avoided by user programs, since BIOS routines may
                ; have expectations about which bank is selected when they
                ; are called.  We will, however, do bank switching through
                ; the BIOS selmem routine.  For generality we will use the
                ; BIOS vector at location 1.
                ;
FFFF =          true:   equ     0ffffh
0000 =          false:  equ     not true
                ;
0000 =          alone:  equ     false   ;make false if attached to DDT/SID
                ;
0001 =          biosv:  equ     1       ;address of wboot in BIOS found here
004E =          selmem: equ     4eh     ;offset from wboot
                ;
0100 =          buflen: equ     100h    ;move block size
                ;
                ; default parameters
1000 =          movcnt: equ     1000h   ;to move 16 pages (4K) at a time
0100 =          b0dft:  equ     100h    ;start of block in bank 0
0100 =          b1dft:  equ     100h    ;start of block in bank 1
                ;

                ; zero page addresses
0005 =          bdos:   equ     5       ;bdos entry point
0028 =          rstv:   equ     28h     ;RST 5 used as entry vector
                ;
                ; BDOS functions used
0001 =          conin:  equ     1       ;get a char
0009 =          printf: equ     9       ;print a string
000A =          rdbuf:  equ     10      ;read a line
                ;
                ; This is standard prefix for a Resident System Extension
                ;  see CP/M 3 Programmer's Guide, 1st ed., sec. 4.4, p.168
                ;
0000 0000000000serial: db       0,0,0,0,0,0
0006 C3A203     start:  jmp     install ;one-time routine
0009 C30000     next:   jmp     0       ;altered at installation
```

(Continued on page 40)

NEW LANGUAGE BREAKS OLD RULES. GIVES PROGRAMMERS POWER, SPEED AND SIMPLICITY.

Try this remarkable language, PROMAL™, for 30 Days AT NO RISK and...

We think you'll be thrilled with this breakthrough system when you discover its power, ease of use, and dazzling performance on your IBM PC, Apple IIe/IIc, or Commodore 64. **But we don't expect you to accept our claims for PROMAL without proof,** so we invite you to explore the power of PROMAL on your own during our 30-day trial period.

Broken Rules

Now that PROMAL 2.0 has broken the rules, a structured language doesn't have to be slow, unwieldy and difficult to use. PROMAL is fast, elegant, and simple.

What Is PROMAL?

PROMAL stands for **PRO**grammer's **M**icro **A**pplication **L**anguage. But PROMAL is more than a high-level language, it's a total structured programming development system with a fast, one-pass compiler, a versatile full-screen editor, plus an integrated machine-language subroutine library. And for APPLE and Commodore systems it includes a DOS-like system "Executive."

Better By Design

PROMAL was designed from "scratch" for **optimum performance** and ease of use on microcomputers. It has a simplified syntax with no awkward terminators like ";" or "}" and **indentation is part of the syntax,** so structuring your code is natural and easy. Just compare PROMAL with BASIC in this example:

Equivalent Program Segments

```
;-------PROMAL--------
REPEAT
    PROMPT_AT 5,24, "Add/Chg/Quit?"
    IF Reply = 'A'
        ADD Item
        New_Items = New_Items + 1
    ELSE IF Reply = 'C'
        CHANGE Item
UNTIL Reply = 'Q'
```

```
11910 REM-----BASIC----------
11920 CL=5:LN=24:PR$="Add/Chg/Quit?"
11925 GOSUB 9490:REM GET REPLY
11930 IF RP$<>"A" THEN 11950
11940 I9=IT:GOSUB 10100:REM ADD
11945 NI=NI+1:GOTO 11920
11950 IF RP$<>"C" THEN 11970
11960 I9=IT:GOSUB 6050:REM CHG
11970 IF RP$<>"Q" THEN 11920
```

PROMAL is readable and understandable. You see the logic from the structure. And PROMAL lets you call procedures by name–so no more GOSUBs. But there's more.

Slick Editor

Editing your source is a snap with the specially-designed and integrated **full-screen Editor**–it not only helps you structure your program, it **even finds compilation errors**– automatically.

Quick Compiler

The compiler is a **lightning-fast,** one-pass, recursive descent design. On the IBM PC it crunches source to object at **2000 lines per minute,** and it's equally impressive on the Apple and C64. And your PROMAL source code is **portable from machine to machine.** That means your source can be used on all PROMAL target machines.

Run-Time Speed Demon

PROMAL blows away Apple II and C64 languages from BASIC and PASCAL to FORTH. (Send $3 for a copy of our full benchmark report.) It's **2000% faster** than BASIC. And on a normal IBM PC, the native 8088 code from **PROMAL beat Turbo Pascal 3.0** by 10% on the standard sieve benchmark!

DOS For Those Without

If you don't have a real "DOS," then PROMAL gives you a **true operating system** environment with the built-in operating system Executive. (See box.)

PROMAL 2.0 FEATURES

COMPILED LANGUAGE
- Structured indentation syntax
- No line numbers or terminators
- Long variable names (31 characters)
- Global, Local, & Argument variables
- Byte, Word, Integer & Real data types
- Decimal or Hex number types
- Functions & Procedures with passed arguments
- Predefined DATA of any type
- Multi-Dimensional Arrays (any type)
- Strings & pointers
- Control Statements: IF, IF-ELSE, WHILE, FOR, CHOOSE, REPEAT-UNTIL, BREAK, NEXT, INCLUDE, ESCAPE, REFUGE
- Bit-operators, shifts, type casts
- Variables at any memory location
- Simple Machine Language interface
- Recursion supported
- Program chaining and overlays (IMPORT/EXPORT)
- Separate compilation of modules
- Load and run relocatable M/L programs
- Compile errors trapped for Editor

EXECUTIVE (APPLE II & C64 Only)
- Command driven, with line editing
- Multiple user programs in memory at once
- Function key definitions
- Progam abort and pause
- Prior command recall
- I/O Re-direction & batch jobs
- "DOS"-like commands: COPY, RENAME, DELETE, display FILES, TYPE, HELP, etc.
- Memory MAP, SET, and display commands

EDITOR
- Full-screen, cursor driven
- Function key controlled
- Line insert, delete, search
- String search and replace
- Block copy, move, delete & file read/write operations
- Auto indent, undent support

LIBRARY
- 50 Resident Machine-language commands
- Call by name with arguments
- String handling (9 routines)
- Re-directable I/O (STDIN & STDOUT)
- Formatted numeric output
- Decimal & Hexadecimal I/O
- Block fill/move/read/write
- Cursor control & line editing
- Data type conversion
- Random number function
- Real function support (in PROMAL): ABS, ATAN, COS, EXP, LOG, LOG10, POWER, SIN, SQRT, TAN
- Modem device support & much more

Outside Opinion

Naturally we're enthusiastic about PROMAL, **but here's what other programmers are saying:**

"Excellent... an ideal development system.... Well done indeed!"
M. T. V.
Naperville, Ill.

"I am... so amazed by PROMAL... I cannot believe the high degree of excellence of this entire package."
C. P., Ph.D.
Ridgeway, New York

"I don't know that I've ever seen a [system] as thoughtfully designed and as skillfully executed as PROMAL. Its logic and ease of programming are truly remarkable. Its speed of execution is phenomenal... congratulations."
E. C. R.
Alexandria, VA

Safety In Numbers

SMA, Inc. has been satisfying customers (over 100,000) since 1982 with innovative microcomputer products. Now you can join our thousands of satisfied PROMAL users, by trying it today.

Try It For 30 Days On Us

Send us some bucks and we'll send you PROMAL on trial for 30 days. **If for any reason whatsoever you are not satisfied, just send it back** for a quick refund of your purchase price. No questions asked. No risk.

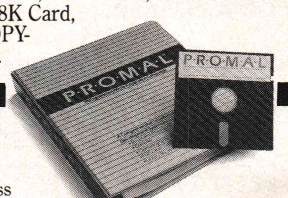
How To Order.

Call TOLL-FREE to order with your credit card or use the handy order form below to send in your check or money-order for your 30-day trial. Don't wait, you deserve the power of PROMAL today!

1-800-762-7874
In NC: 919-878-3600

SMA
Systems Management Associates, Inc.
3325 Executive Drive, Dept. D-2
Raleigh, North Carolina 27609

PROMAL runs on IBM PC/PCjr with 192K, Commodore 64/128, APPLE IIc, or APPLE IIe with 80 Col. 128K Card, and is NOT COPY-PROTECTED.



Order Form for PROMAL 30-Day Trial!

My system is (check one)
☐ IBM PC/100% compatibles ☐ APPLE IIc/IIe
☐ COMMODORE 64/128

Please RUSH me:
☐ PROMAL Developer's System–Compiler, Editor, Library, Demo disk, 280-page manual, (Plus Executive for Apple and C-64) and stand-alone program generation (no royalties).
$99.95 + 5.00 Shipping & Handling
☐ End-User System for Apple IIc/IIe and Commodore 64/128–all features of Developer's Version except stand-alone program generation (Executive needed for program execution)
$49.95 + 5.00 Shipping & Handling
☐ Graphics ToolBox (Apple/C64 only)–20 routines for hi-res graphics: windows, clipping, text-on-graphics using scaled, rotated, user-defined fonts.
$29.95 + 2.50 Shipping & Handling

MEMBER DIRECT MARKETING ASSOCIATION

Please charge my
☐ Visa
☐ MasterCard
☐ American Express
☐ My check is enclosed

Card Number ________
Signature ________ Exp. Date ____
Name ________
Address ________
City ________
State ________ Zip ____

NC residents add 4½% sales tax.
Foreign orders add $20.00 additional shipping.

PROMAL is a trademark of Systems Management Associates, Inc. Turbo Pascal is a trademark of Borland International, Inc.

Listing One

```
000C 0000       prev:   dw      0
               ;
                        if      alone
                rmvflg: db      0       ;keep this in memory
                        else
000E FF         rmvflg: db      0ffh    ;remove when main program ends
                        endif
                ;
000F 00         nonbnk: db      0       ;banked system
0010 42414E4B53         db      'BANKSWAP'
0018 00         loader: db      0
0019 0000               db      0,0
                ; *** note: If BANKSWAP is to be attached directly to SID.COM
                ; or DDT.COM then make rmvflg 0ffh to force removal
                ;
                bankexam:
001B 210000             lxi     h,0     ;get stack pointer
001E 39                 dad     sp      ;...and hold it for return
001F 220F04             shld    holdsp  ;...reset SP to a location
0022 310804             lxi     sp,locstk       ;...in common memory
                ;
                ; Main loop--exit by Quit or Remove command
                bankex2:
0025 CD2E00             call    prompt  ;this returns address of sub
0028 CD6D00             call    doit    ;do subroutine addressed by HL
002B C32500             jmp     bankex2
                ;
002E 111F02     prompt: lxi     d,menu  ;get ready for menu
0031 3A9103             lda     quietflag
0034 B7                 ora     a       ;suppress menu?
0035 CA3B00             jz      prmpt2
0038 11F402     prmptl: lxi     d,query ;set for prompt only
003B 0E09       prmpt2: mvi     c,printf
003D CD0500             call    bdos
                ; Get a character
0040 0E01               mvi     c,conin
0042 CD0500             call    bdos
0045 CD7001             call    crlf
                ; make upper case, reject non-alpha
0048 E65F               ani     5fh

004A FE41               cpi     'A'
004C DA3800             jc      prmptl  ;ask again if invalid
004F FE5B               cpi     'Z'+1
0051 D23800             jnc     prmptl  ;ask again if invalid
                ; find match in alphtbl
0054 010700             lxi     b,altblen       ;length of table
0057 211102             lxi     h,alphtbl+altblen       ;work back
005A BE         try:    cmp     m
005B CA6300             jz      match
005E 2B                 dcx     h
005F 0D                 dcr     c       ;count down
0060 C25A00             jnz     try
                ; if c= 0 no match found.  Now form address
0063 211102     match:  lxi     h,addrtbl
0066 09                 dad     b       ;add offset
0067 09                 dad     b       ;again, 2 bytes per table entry
                ; get the command address
0068 7E                 mov     a,m
0069 23                 inx     h
006A 66                 mov     h,m
006B 6F                 mov     l,a
006C C9                 ret             ;HL has action address
                ;
006D E9         doit:   pchl            ;call here to use action address
                ;
                getbank:
006E 2A9C03             lhld    b0start ;setup addresses
```

(Continued on page 42)

FREE 8087 VERSION with orders placed prior to Dec. 15.

We've just invented an Algorithm Developer.

It just happens to be the best **programmable software calculator** on the market today.

```
amort.CFG
6-amrtp
months=months+1;pr=((pmt*12/int)/(1+int/12)
^(mths+1))*[1-(1+int/12)];@next
7-amrti
in=-pmt-((pmt*12/int)/(1+int/12)^(mths+1))
*[1-(1+int/12)];@next
8-sumr
prinpd=prinpd+pr;intpd=intpd+in;mths=mths-1;
@ifqt (mths==168);@goto(6)
```

A sample formula listing

PRO/SCI™ **99 bucks** and a phone call.

Consider its performance.

- Programmable in simple BASIC—like statements
- Runs in *both* foreground *and* background modes
- Set up: Requires one key stroke
- Runs in background mode with most popular products (e.g. LOTUS, WordStar, dBase)
- Selects and moves rows of numbers *from* foreground document *to* calculator for *any* computation (e.g., standard deviation for 22 rows of numbers requires six key strokes)
- Returns results (at user's option) of all calculations to the foreground document
- Single-Step mode aids in algorithm de-bug
- Spreadsheet comparison
  - — Greater range of formula capabilities
  - — Access requires only key stroke
  - — Transfers numbers to calculator without retyping
- Full formula line editing
- Ten formulas per formula file
- Unlimited number of formula files
- 8087 version available
- All calculations double precision
- Includes Accountant's style calculator with HEX, OCT, and BIN!
- Runs with SIDEKICK — in all modes

Functions

sin, cos, tan, asin, ln, exp, log, sqrt, abs, int, frac, round, mean, std, var, perm, comb, mod, rand, sum, min, max, integrate

Operators

arithmetic: +, −, *, /
logical: #AND#, #OR#, #NOT#
relational: >, <, >=, <=, ==, <>
exponentiation: **, ∧
factorial: !

Programming Statements

Conditional and absolute looping and branching
Indexing by variable increment and test
Formula con-catenation (to 1000 columns)
Printing statements for line printer tabulations
Debug mode — single-step and display of all variables
Displayed decimal point control

Constants

pi, e, c, K, h, q, R, N_0, G, g

Send me **PRO/SCI**™ for $99 and include 8087 Version at NO EXTRA CHARGE.
(Plus $5.00 shipping & handling)

☐ American Express ☐ VISA
☐ Money Order ☐ MasterCard
☐ Check

Card No. ____________
Expiration Date ____________
Signature ____________

Requires IBM PC or true compatible with 128K RAM and one disk drive and MS-DOS 2.1 or higher

NAME ____________
ADDRESS ____________
CITY/STATE/ZIP ____________
TELEPHONE ____________

California residents add 7% sales tax. Outside U.S.A. add $15.00. (If outside of U.S.A. payment must be by bank draft payable in the U.S. and in U.S. dollars.) Sorry, no C.O.D.

SYMSOFT
P.O. Box 4477
Mtn. View, CA 94043
Orders Taken:
Mon.-Fri.; 8am-4pm
800/227-6703
OUTSIDE CALIFORNIA
800/632-7979
INSIDE CALIFORNIA

LOTUS is a trademark of LOTUS • WordStar is a trademark of Micro Pro • dBase is a trademark of Ashton-Tate.

Circle **no. 146** on reader service card.

Listing One

```
0071 220A04          shld    source
0074 2A9E03          lhld    blstart
0077 220C04          shld    dest
007A 3AA103          lda     length+1         ;low byte ignored
007D 320E04          sta     count
                ; page by page take a chunk of bank 0 to buffer, then move
                ; to bank 1 destination
                get2:
0080 F3              di               ;be sure no interrupts
0081 3E00            mvi     a,0
0083 2A0804          lhld    selmv
0086 CD6D00          call    doit
0089 CDF400          call    getbuf
008C 3E01            mvi     a,1
008E 2A0804          lhld    selmv   ;point to BIOS selmem routine
0091 CD6D00          call    doit
0094 FB              ei               ;interrupts safe again
0095 CDFD00          call    putbuf
0098 110001          lxi     d,buflen
009B 2A0A04          lhld    source
009E 19              dad     d
009F 220A04          shld    source
00A2 2A0C04          lhld    dest
00A5 19              dad     d
00A6 220C04          shld    dest
00A9 210E04          lxi     h,count ;repeat for required # of pages
00AC 35              dcr     m
00AD C28000          jnz     get2
00B0 C9              ret
                ;
                putbank:
00B1 2A9E03          lhld    blstart
00B4 220A04          shld    source
00B7 2A9C03          lhld    b0start
00BA 220C04          shld    dest
00BD 3AA103          lda     length+1         ;low byte ignored
00C0 320E04          sta     count
                ; page by page, move bank 1 data to buffer, then move it
                ; to bank 0
                put2:
00C3 CDF400          call    getbuf
00C6 F3              di               ;be sure no interrupts
00C7 3E00            mvi     a,0
00C9 2A0804          lhld    selmv
00CC CD6D00          call    doit
00CF CDFD00          call    putbuf
00D2 3E01            mvi     a,1
00D4 2A0804          lhld    selmv
00D7 CD6D00          call    doit
00DA FB              ei               ;interrupts safe again
00DB 110001          lxi     d,buflen
00DE 2A0A04          lhld    source
00E1 19              dad     d
00E2 220A04          shld    source
00E5 2A0C04          lhld    dest
00E8 19              dad     d
00E9 220C04          shld    dest
00EC 210E04          lxi     h,count
00EF 35              dcr     m
00F0 C2C300          jnz     put2
00F3 C9              ret
                ; source to buffer
                getbuf:
00F4 2A0A04          lhld    source
00F7 111104          lxi     d,buffer
00FA C30401          jmp     pbl
                ; buffer to dest
                putbuf:
```

(Continued on page 44)

C Programmers:

Consider 104 Ways To Be More Productive

If you find and choose the right development software, you can: cut development effort, make impractical projects feasible, and eliminate unproductive, frustrating aspects of programming.

Confused? We'll help you sort thru the huge number of alternatives. Call for comparisons or information.

We carry 27 C Compilers, 4 C Intepreters, 49 Support Libraries, 5 C source debuggers, and 19 other C Addons for programming with MSDOS, Macintosh, or CP/M – more than 104 products, really. Here are some of the best products available:

Learn C Programming Only $95

"Introducing C" Interpreter

Computer Innovations has done it again! This interactive implementation is combined with a full screen editor and a thorough, self-paced manual.

You can develop programs faster by getting immediate feedback. Programs will start instantly upon your command. There is no need to wait "for compile and link."

Introducing C includes demo programs, powerful C language interpreter, complete C function library, full screen editor, color graphics, and C language compatibility. PCDOS $95

Add Communications Features to Your Programs

Greenleaf Comm Library

Greenleaf now enables you to communicate with remote systems or databases with an asynchronous communications library for C.

Individual transmission and reception ring buffers combine with an interrupt driven system. This eliminates the extra function of separately calling up the communications program.

Included are 3 library/object files, 220 functions; 230 page manual, complete source code, library tailor-made to suit compiler and memory, Hayes-compatible modem commands, and a complete sample file transfer program. MSDOS $169

First Aid for C Programs

C ToolSet

Save time and frustration when analyzing and manipulating C programs.

DIFF and CMP - for "intelligent" file comparisons.

XREF - cross references variables by function and line.

C Flow Chart - shows what functions call each other.

C Beautifier - make source more readable.

GREP - search for patterns.

There are several other programs for converting and printing programs.

Portable. Full source code. CPM, MSDOS $135

SORT/MERGE Files for Clean, Fast Maintenance

with OPT-TECH SORT

Performance should not suffer with DOS or other "free" sorts. ISAMs alone are slow when 10% or even less is changed/added.

OPT-TECH includes:
- CALLable and Standalone use
- C, ASM, BAS, PAS, FTN, COBOL
- Variable and fixed length
- 1 to 9 fields to sort/merge
- Autoselect of RAM or disk
- Options: dBASE, BTrieve files
- 1 to 10 files Input
- No software max for # Records
- All common field types
- By pass headers, limit sort
- Inplace sort option
- Output = Record or keys

Try what you're using on an XT: 1,000 128 byte records, 10 byte key in 33 seconds. MSDOS. $90.

Shorten Development Time, Cut Frustrations

BRIEF, The Programmer's Editor

Compile within BRIEF; use autoindent; "templates", C specific error support... use windows, UNDO, and multiple large files.

But edit YOUR WAY.

Every feature you'd expect and more are integrated elegantly – and it can be modified by you.

You deserve:

"...the best text editor you can buy." – John Dvorak, InforWorld, 7/8/85

"...the best code editor..." John Irwin, Data Based Advisor, 8/85

PCDOS $Call

Fast File Access with Source

C-Index +

C-Index + contains a high performance ISAM, balanced B + Tree indexing system with *source* and *variable length* fields. The result is a complete data storage system to eliminate tedious programming and add efficient performance to your programs.

Features include random and sequential data access, virtual memory buffering, and multiple key indexes.

With *no royalties* for programs you distribute, full source code, and variable length fields C-Index + fits what you are likely to need.

Save time and enhance your programs with C-Index +. MSDOS $375

Get File Access with TIGHTER Control than an ISAM or a Sort.

db_VISTA Data Management

6 files updating at once, entering data with validation...with no delays! Multiuser access at the same time. db_VISTA can do it.

db_VISTA makes practical sophisticated applications that cannot be handled with reasonable performance by a "relational" or "flat file" system. But, if you want a simple ISAM, it is included too.

Full source, no royalties and "normal" indexed file management are part of db_VISTA. Get more for the price of only an ISAM.

You can minimize data stored and access records even faster and more logically than just using indexes. Example: address and transaction data should not require redundant storage of customer names or numbers. Use pointers. Related data fields point to other related groups – the "network model" of data.

Use db_VISTA as a "normal ISAM" or save programming time, access time and file size. Lattice, C86, Williams, Desmet, Microsoft C.

MSDOS Multiuser source $945, Object $445
Single user source $445, Object $275

Call for details, comparisons, or for our "C Extras Packet" with over 50 pages of information about C support products.

THE PROGRAMMER'S SHOP

The programmer's complete source for software, services and answers

128-DC Rockland Street, Hanover, MA 02339 (617) 826-7531 (800) 421-8006

Ask about COD and PO's. All formats available. Prices subject to change. Names of products and companies are generally their trademarks.

Circle no. 141 on reader service card.

Listing One

```
ØØFD 2AØCØ4            lhld    dest
Ø1ØØ 1111Ø4            lxi     d,buffer
Ø1Ø3 EB                xchg
               ; common code for getbuf and putbuf
Ø1Ø4 Ø1ØØØ1    pbl:    lxi     b,buflen
               ; move (BC) bytes from (HL) to (DE) (could use BIOS move
               ; routine for this)
Ø1Ø7 7E        move:   mov     a,m
Ø1Ø8 12                stax    d
Ø1Ø9 23                inx     h
Ø1ØA 13                inx     d
Ø1ØB ØB                dcx     b
Ø1ØC 78                mov     a,b
Ø1ØD B1                ora     c
Ø1ØE C2Ø7Ø1            jnz     move
Ø111 C9                ret
               ;
               ; Go back to SID/DDT
Ø112 1164Ø3    quit:   lxi     d,qmsg  ;say how to get back
Ø115 ØEØ9              mvi     c,printf
Ø117 CDØ5ØØ            call    bdos
Ø11A 2AØFØ4            lhld    holdsp  ;restore stack pointer
Ø11D F9                sphl
Ø11E FF                rst     7        ;back to DDT or SID
               ;
                       if      alone
               ; Set for removal on termination of SID or DDT
               remove: lxi     h,rmvflg         ;set the remove flag
                       mvi     m,Øffh           ;...in the RSX prefix
                       lxi     h,rstv           ;then wipe out the entry
                       mvi     m,Øffh           ;...JMP with an RST 7
                       rst     7                ;leave via the debugger
                       endif   ;alone
               ;
               ; Set up addresses for move, also set up length
Ø11F 1117Ø3    adset:  lxi     d,bØid  ;tell current bank Ø addr
Ø122 ØEØ9              mvi     c,printf
Ø124 CDØ5ØØ            call    bdos
Ø127 2A9CØ3            lhld    bØstart ;get the address
Ø12A CDDAØ1            call    addro   ;and print it
Ø12D 219CØ3            lxi     h,bØstart
Ø13Ø CD81Ø1            call    update  ;enter hex to (HL)
Ø133 1125Ø3            lxi     d,b1id  ;do it again for bank 1
Ø136 ØEØ9              mvi     c,printf
Ø138 CDØ5ØØ            call    bdos    ;tell
Ø13B 2A9EØ3            lhld    b1start
Ø13E CDDAØ1            call    addro
Ø141 219EØ3            lxi     h,b1start
Ø144 CD81Ø1            call    update  ;get new address, if any
               ; Can fall through from adset or enter directly here to set
               ; length of block moved
Ø147 1133Ø3    lnset:  lxi     d,lnmsg ;tell current length
Ø14A ØEØ9              mvi     c,printf
Ø14C CDØ5ØØ            call    bdos
Ø14F 2AAØØ3            lhld    length
Ø152 CDDAØ1            call    addro
Ø155 21AØØ3            lxi     h,length
Ø158 CD81Ø1            call    update  ;offer to change it
Ø15B CD7ØØ1            call    crlf
Ø15E C9                ret
               ;
               ; Toggle menu off/on
Ø15F 3A91Ø3    xpert:  lda     quietflag
Ø162 2F                cma                      ;toggle
Ø163 3291Ø3            sta     quietflag
Ø166 C9                ret
               ;
               ; Get here on invalid command
```

(Continued on page 46)

VEDIT PLUS

We have a Surprise for You.

NEW FEATURES MAKE IT BETTER THAN EVER

VEDIT is the most often reviewed and highly acclaimed text editor ever. And no wonder - we have listened to and supported our users for almost six years and have continually improved our products by incorporating hundreds of their suggestions. Now we have a revolutionary new version of VEDIT PLUS with all the program development features you've asked for.

The unique on-line interactive help is a first - it can be easily expanded or edited. You can create your own on-line help with menus and sub-menus for compilers, style guides, even non-computer subjects.

NEW FEATURES

- Memory management supports up to 1 M Byte
- MS-DOS, PCDOS pathname support
- Interactive on-line help
- Paragraph justification
- Create your own edit functions with macros
- Auto-execute macros as application programs
- Easy to use installation/customization program for keyboard assignment, screen attributes, etc.

The supplied macros are menu driven and immediately usable. Sort a mailing list. Perform a full screen file comparison and update one file from the other - merge the work done by two programmers on the same file. Replace the command prompt with a menu for new users. And an exceptional 8080 to 8086 translator is an inexpensive option.

Your own editing macros are easy to write and will automate otherwise tedious chores. You can use a macro the instant you type it or load it from disk - there is no time wasted compiling or linking. Macros are accessible from function keys - allowing you to create your own editing functions.

- Simultaneously edit up to 36 files of unlimited size
- Unlimited file handling - merge, split, extract, view, print and more
- Search with wild cards and patterns
- On-line integer calculator
- Complete macro programming language including:
  IF-THEN-ELSE and looping
  User prompts and input
  Algebraic expressions with variables
  Complete TECO capability
- Free macros

VEDIT PLUS isn't only for programming. The word processing features include word wrap, paragraph formatting with justification, printing and horizontal scrolling for spreadsheets. Converts WordStar files and edits dBASE™ source files. Add V-PRINT for fancier features such as automatic index generation and printer font support (incl. laser printers). Then add V-SPELL, the ultimate spelling corrector, and you'll have a word processing system that can do virtually everything you need.

As a programming or writing professional, VEDIT PLUS gives you refinement, power and flexibility you will never outgrow.

VEDIT PLUS supports virtually every MS-DOS, PCDOS, CP/M-86 and CP/M computer and is a favorite among OEMs. VEDIT PLUS is not copy protected. Order direct or from any of our over 400 dealers. $225. (Discounts available for current VEDIT users.) Site licensing and educational discounts.

CompuView

1955 PAULINE BLVD., ANN ARBOR, MICHIGAN 48103
(313) 996-1299, TELEX - 701821

MSDOS is a trademark of Microsoft PCDOS is a trademark of IBM CPM80 is a trademark of Digital Research WordStar is a trademark of MicroPro

Circle no. 122 on reader service card.

Listing One

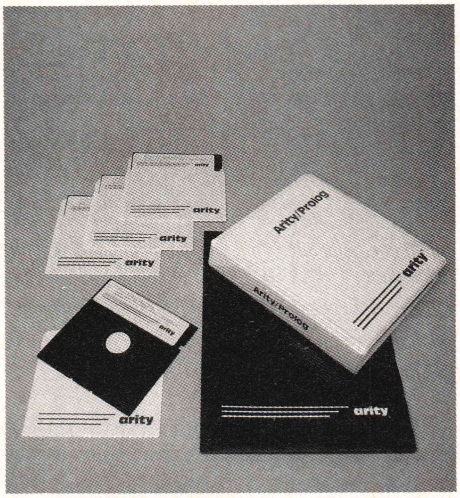
```
0167 11FA02     na:     lxi     d,namsg         ;say can't do it
016A 0E09               mvi     c,printf
016C CD0500             call    bdos
016F C9                 ret
                ;
0170 C5         crlf:   push    b
0171 D5                 push    d
0172 E5                 push    h
0173 F5                 push    psw
0174 111403             lxi     d,crlfstring
0177 0E09               mvi     c,printf
0179 CD0500             call    bdos
017C F1                 pop     psw
017D E1                 pop     h
017E D1                 pop     d
017F C1                 pop     b
0180 C9                 ret
                ;
                ; get string, do nothing if null, else convert, store at (HL)
                update:
0181 E5                 push    h               ;save the location
                ; loop back here if input is not valid
0182 210000     updl:   lxi     h,0             ;initial buffer
0185 229303             shld    inbuf+1
0188 114203             lxi     d,chquery       ;say what's up
018B 0E09               mvi     c,printf
018D CD0500             call    bdos
0190 119203             lxi     d,inbuf
0193 0E0A               mvi     c,rdbuf         ;read console until <ret>
0195 CD0500             call    bdos
0198 CD7001             call    crlf
019B 3A9303             lda     inbuf+1         ;get length of hex string
019E B7                 ora     a               ;check for 0 length input
019F C2A401             jnz     convert
                ; null string, go back
01A2 E1                 pop     h               ;retrieve value at entry
01A3 C9                 ret
                ;
                ; Convert the hex string in the buffer to binary
                convert:
01A4 210000             lxi     h,0     ;start with a zero
01A7 47                 mov     b,a     ;hold length in B
01A8 119403             lxi     d,inbuf+2
01AB 1A         conv2:  ldax    d       ;get first (or next) char
01AC 13                 inx     d
01AD FE60               cpi     60h
01AF DAB401             jc      conv3
01B2 E65F               ani     5fh     ;make lower case if necessary
01B4 D630       conv3:  sui     '0'
01B6 FA8201             jm      updl    ;must be valid hex, 0..9, A..F
01B9 FE0A               cpi     0ah
01BB DACA01             jc      num     ;jump if a good numeric
01BE D607               sui     7
01C0 FE0A               cpi     0ah
01C2 DA8201             jc      updl    ;error if not good alpha
01C5 FE10               cpi     10h
01C7 D28201             jnc     updl    ;error if not good alpha
01CA 29         num:    dad     h       ;multiply current val by 16
01CB 29                 dad     h
01CC 29                 dad     h
01CD 29                 dad     h
01CE 85                 add     l       ;add new least significant digit
01CF 6F                 mov     l,a
01D0 05                 dcr     b       ;countdown the digits
01D1 C2AB01             jnz     conv2
01D4 EB                 xchg            ;result to DE
01D5 E1                 pop     h       ;HL at entry says where to it
```

(Continued on page 48)

More Power Than You Thought Possible

Arity offers the first serious implementation of Prolog for IBM personal computers. Arity/Prolog is a powerful, highly optimized, and extended version of the logic programming language Prolog. Imagine building software applications with a language that solves problems through deduction and logical inference. The task of creating complex programs is much faster and easier, resulting in lower development costs. Arity/Prolog is now in use in a wide range of applications in industry, business, research, and education. The solution—the *Arity/Prolog Interpreter:*

- Source level debugger
- Virtual databases, each with a workspace of 16 megabytes
- Floating-point arithmetic
- String support for efficient text handling



- Interface to assembly language and 'C'
- Text screen manipulation
- Integrated programming shell to MSDOS
- Comprehensive set of evaluable predicates
- Definite clause grammar support

Arity/Prolog Interpreter $495.00

Arity also offers the *Arity/Prolog Compiler and Interpreter,* a sophisticated development environment for building AI applications. Essential for producing fast, serious production code.

Arity/Prolog Compiler and Interpreter $1950.00

The *Arity/Prolog Demo Disk* is available for $19.95. ■ Arity/Prolog products run on the IBM PC, XT, AT, and all IBM compatibles. ■ To order, call (617) 371-2422 or use the order form below.

arity corporation 358 Baker Avenue, Concord, MA 01742

Name

Organization

Address

Quantity	Product	Unit Price	Total Price
	Arity/Prolog Compiler & Interpreter	$1950.00	
	Arity/Prolog Interpreter	$ 495.00	
	Arity/Prolog Demo Disk	$ 19.95	
		Subtotal	
		MA residents add 5% sales tax	
		Total Amount	

☐ Enclosed is a check or money order to Arity Corporation

☐ Please bill my ☐ Mastercard ☐ Visa ☐ American Express

Account #

Valid ____/____ to ____/____ ______________ signature

☐ Please send me more information about Arity and Arity/Prolog

arity 358 Baker Avenue, Concord, MA 01742

M-AD-05

Circle **no. 121** on reader service card.

Listing One

```
01D6 73              mov     m,e
01D7 23              inx     h
01D8 72              mov     m,d
01D9 C9              ret
             ;
             ; Print HL as hex
             addro:
01DA D5              push    d
01DB E5              push    h
01DC EB              xchg
01DD 215C03          lxi     h,hexstr         ;where to build string
01E0 7A              mov     a,d
01E1 CDF301          call    byte    ;get A as 2 ASCII chars at (HL)
01E4 7B              mov     a,e
01E5 CDF301          call    byte    ;again, low byte
01E8 115C03          lxi     d,hexstr
01EB 0E09            mvi     c,printf
01ED CD0500          call    bdos    ;print it
01F0 E1              pop     h
01F1 D1              pop     d
01F2 C9              ret
             ;
             ; Convert byte to hex ASCII chars, put at (HL)
01F3 F5      byte:   push    psw
01F4 1F              rar             ;get high nybble
01F5 1F              rar
01F6 1F              rar
01F7 1F              rar
01F8 CDFC01          call    nybble
01FB F1              pop     psw     ;fall through for low nybble
             ; nybble makes 1 char, advances output pointer
01FC E60F    nybble: ani     0fh
01FE C630            adi     '0'
0200 FE3A            cpi     3ah
0202 DA0702          jc      nput
0205 C607            adi     7
0207 77      nput:   mov     m,a
0208 23              inx     h
0209 C9              ret
             ;
             ; Acceptable command inputs go in this table
             alphtbl:
020A 00              db      0       ;dummy for no match
020B 41              db      'A'
020C 47              db      'G'
020D 4C              db      'L'
020E 50              db      'P'
020F 51              db      'Q'
             ;
                     if      alone
                     db      'R'
                     endif   ;alone
             ;
0210 58              db      'X'
0007 =       altblen:        equ     $-alphtbl
             ; addresses of action routines, same order as alphtabl
             addrtbl:
0211 6701            dw      na      ;not available
0213 1F01            dw      adset   ;address set
0215 6E00            dw      getbank
0217 4701            dw      lnset   ;length set
0219 B100            dw      putbank
021B 1201            dw      quit
             ;
                     if      alone
                     dw      remove
                     endif
             ;
```

(Continued on page 50)

THE PROGRAMMER'S SHOP™

helps save time, money and cut frustrations. Compare, evaluate, and find products.

SERVICES
- Programmer's Referral List
- Compare Products
- Help find a Publisher
- Evaluation Literature FREE
- BULLETIN BOARD - 7PM to 7AM 617-826-4086
- Dealer's Inquire
- Newsletter
- Rush Order
- Over 700 products

SERVICE: FREE NEWSLETTER

Software development and AI on micros: trends, forecasts, controversies, innovations, and techniques. Plus announcement of 80 NEW tools. **CALL** for "Newsletter Packet."

RECENT DISCOVERY

Periscope II symbolic debugger - some source level, 2 screens, interrupt switch $129

AI - Expert System Dev't

ExpertEASE - Inductive. PCDOS Call
EXSYS - All RAM, Probability. Why. Trees, Solid, files, popular PCDOS $359
INSIGHT 1 - Probabilities, required thresholds, menus, fast PCDOS $ 95
INSIGHT 2 - adds backward, forward, partitions, dB2, lang. access. PCDOS $449
Others: APES ($359), Advisor ($949), ES Construction ($100), ESP ($845), Expert Choice ($449), more.

AI - LISP

	List	Our
GC LISP - "Common", rich.		
Interpreter - Interactive Tutorial	495	Call
LARGE Model - 2 to 15 meg.	695	649
Compiler and Interpreter	1190	1045

IQ LISP - MacLISP and InterLISP. Well-liked, 1,000K. PCDOS $149
TLC LISP - "LISP-Machine" - like, all RAM, classes, turtle graphics, 8087, **compiler.** CPM-86, MSDOS $235
WALTZ LISP - "FRANZ LISP" - like, big nums, debug, CPM-80, MSDOS $149
Others: ExperLISP ($439), TransLisp-PC ($75), BYSO ($125), MuLISP-86 ($199)

AI - PROLOG

ARITY PROLOG - full, debug, ASM, C, virtual. **Compiler** $1950 MSDOS $495
MPROLOG - Rich syntax, editor, segment work space, portable. PCDOS $725
Prolog-86 - Learn Fast. Standard, tutorials, samples MSDOS Call
Others: Prolog-1 ($359), Prolog-2 ($1895), Prolog V ($65), V + ($95), MicroProlog ($229), Prof. MicroProlog ($359).

Editors for Programming

BRIEF Programmer's Editor - undo, windows, reconfigure PCDOS Call
C Screen with source 80/86 $ 75
EMACS by UniPress - powerful, multifile, windows, DOS, MLISP. programming. Source: $949 MSDOS $299
Entry System for C - Bellesoft PCDOS $325
FirsTime by Spruce - Improve productivity. Syntax directed for Turbo ($69), Pascal ($229), or C ($239)
PMATE - power, multitask 80/86 $159
VEDIT - well liked PCDOS $119
XTC - multitasking PCDOS $ 95

Feature

MultiHALO - full 2.0, all graphics boards, printers, comprehensive. For **Turbo ($95)**, for GC Lisp ($250), Others ($195).

C Language - Compilers

BDS C - solid value, fast CPM80 $125
C86 by CI - 8087, reliable MSDOS Call
Hippo Level 2 ($375), Lev. 1 MAC $109
Lattice C - from Lifeboat MSDOS $289
from Lattice MSDOS $339
Consulair Mac C w/toolkit MAC $299
Megamax - tight, full MAC $239
Microsoft C 3.0 - new, tight. MSDOS $259
Q/C 88 by CodeWorks - **Compiler source**, decent code, cross/native MSDOS $295
Williams - source debug. MSDOS $399
Wizard C - Lattice C compatible, full Sys. III, lint, fast. MSDOS $399

C Language - Interpreters

C-terp by Gimpel - full K & R, .OBJ and ASM, large progs. MSDOS $249
INSTANT C - Source debug, Edit to Run-3 seconds MSDOS $399
INTRODUCING C - Interactive C to learn fast, tutorial PCDOS $115
RUN/C - improved MSDOS $109

C Libraries - General

Blaise C Tools 1 ($109), C Tools 2 $89
C Food by Lattice - ask for source $119
C*LIB by Vance $125
C Utilities by Essential - 300 + $149
Greenleaf Functions - portable & ASM $149
Polytron - for Lattice, ASM source $ 99
Software Horizons - Pack 1 $129

C Libraries - Applications

COMMUNICATIONS: Asynch Mgr $175
Greenleaf - full, respected $149
Software Horizons - Pack 3 $139
FILES: Btrieve - multilanguage $199
C Index by Trio - full B + Tree, vary length field, multi compiler
/File is object only $ 89
/Pro is partial source $179
/Plus is full source $349
C Tree by Faircom - source, port. $349
dbcISAM by Lattice for dB2 or 3 $219
dbVISTA - full indexing, plus optional record types, pointers. Network.
Object only - MS C, LAT, C86 $179
Source - Single user $459
Source - **Multiuser** $929

Note: All prices subject to change without notice. Mention this ad. Some prices are specials. Ask about COD and PO's. All format's available.

Call for a catalog, literature, and *solid* value

800-421-8006

THE PROGRAMMER'S SHOP™
128-D Rockland Street, Hanover, MA 02339
Mass: 800-442-8070 or 617-826-7531 1085

C Support - Systems

C Debug - Source debuggers - by Complete Soft ($269), MSD ($149).
CPRINT - by ENSCO, thorough $ 50
C Sharp - well supported, Source, realtime, tasks MSDOS $600
C Sprite Debugger by Lattice $149
C ToolSet - DIFF, xref, source $135
Faster C - replace LINK $ 95
PC **Lint** - full C program checking and big, small model. All C's $119

Low Cost Languages

C/86 by Software Toolworks - Quick $ 65
Introducing C - Step by step training $109
Let's C by Mark Williams $ 59
TransLisp-PC - "Common Lisp", tutorial, graphics, 230 functions, samples $ 75
Modula 2 by ITC - Windows, tight $ 80
PC/Forth by LMI - '83, DOS, ASM $129
Prolog-86 - enhanced, DOS, Edit Call
Quick BASIC by Microsoft - Compile BASICA, Link $ 79
Snobol4 + by Catspaw - Strings $ 85

TURBO PASCAL and SUPPORT

BORLAND: Turbo 3.0 $ 49
3.0 with 8087 or BCD $ 79
3.0 with 8087 and BCD $ 85
Turbo Graphix - graphs, windows $ 39
Turbo Toolbox $ 39
Turbo Tutor $ 29
TURBO . . . Asynch by Blaise, full $ 89
Power Tools by Blaise - library $ 89
Power Utilities - profiler, pp $ 89
MetaWindow by Metagraphics $ 49
OTHERS: FirsTime ($69), Screen Sculptor ($99), Pascal Pac ($100), Tidy ($45), Multi Halo ($95).

Fortran & Supporting

Forlib + by Alpha - graph, comm. $ 59
MACFortran by Microsoft - full '77 $239
MicroSubMath - Trig, Vessel $250
PolyFortran - xref, pp, screen $149
RM Fortran - enhanced "IBM Ftn" $429
Scientific Subroutines - Matrix $149
Strings and Things - registers, shell $ 59

MultiLanguage Support

Btrieve/N ($469), single user $199
Codesifter - executive profiler $109
DoubleDOS - nice, two task $79
LMK Make by Lattice $159
MultiLink - multitasking $249
Panel - Screens, windows $239
PFinish - Profile by line, routine $299
PLink-86 - 32 levels, overlays $289
PolyLibrarian - Manage .OBJs $ 89
TexSys - Source code control $ 89

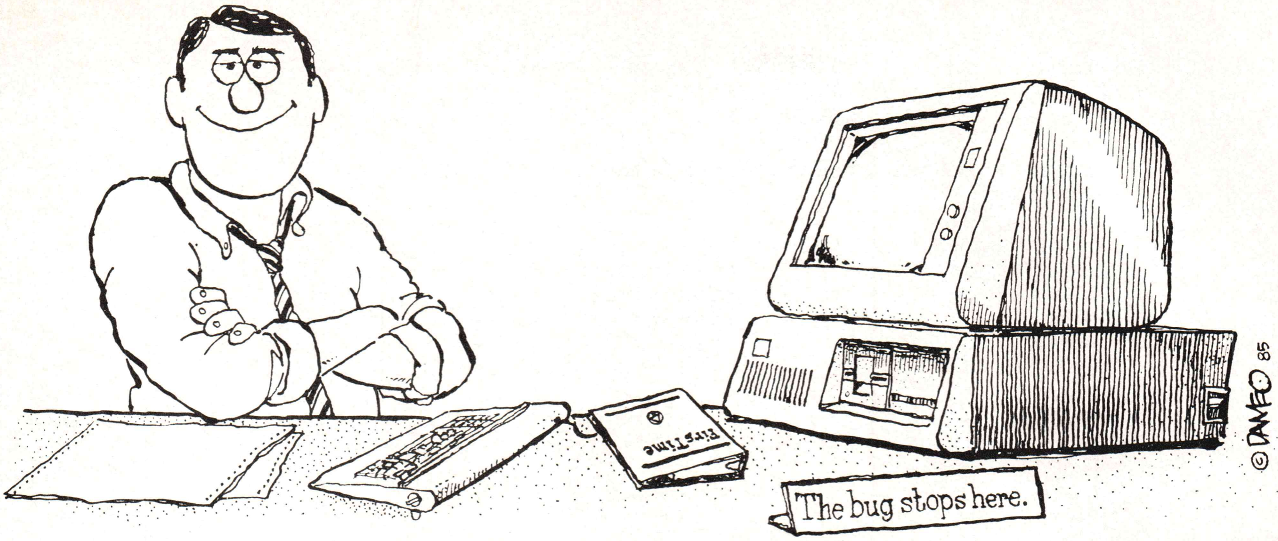
Circle **no. 143** on reader service card.

Listing One

```
 021D 5F01              dw      xpert   ;expert mode, no menu
                ;
 021F 42616E6B73menu:   db      'Bankswap 1.0 by A. S. Woodhull
10/20/83',0dh,0ah
 0248 66756E6374        db      'functions available:',0dh,0ah
 025E 09412E2E2E        db      '       A...set move Addresses',0dh,0ah
 0277 09472E2E2E        db      '       G...Get alternate bank',0dh,0ah
 0290 094C2E2E2E        db      '       L...set move Length',0dh,0ah
 02A6 09502E2E2E        db      '       P...Put alternate bank',0dh,0ah
 02BF 09512E2E2E        db      '       Q...Quit to SID or DDT',0dh,0ah
                ;
                        if      alone
                        db      '       R...Remove BANKSWAP',0dh,0ah
                        endif
                ;
 02D8 09582E2E2E        db      '       X...eXpert mode (no menu)',0dh,0ah
 02F4 0D0A3F3F20query:  db      0dh,0ah,'?? $'
 02FA 2E2E2E6675namsg:  db      '...function not available.'
                crlfstring:
 0314 0D0A24            db      0dh,0ah,'$'
 0317 42616E6B20b0id:   db      'Bank 0 addr: $'
 0325 42616E6B20b1id:   db      'Bank 1 addr: $'
 0333 4C656E6774lnmsg:  db      'Length is now $'
                chquery:
 0342 4368616E67        db      'Change to? (CR to keep): $'
 035C           hexstr  ds      4
 0360 480D0A24          db      'H',0dh,0ah,'$'
 0364 52652D656Eqmsg:   db      'Re-enter BANKSWAP from DDT or SID by "G28"'
 038E 0D0A24            db      0dh,0ah,'$'
                ;
                quietflag:
 0391 00                db      0       ;initialized off

 0392 08        inbuf:  db      8       ;max length of buffer
 0393                   ds      9
                ;
                ; default parameters: alter by Set and Length commands
 039C 0001      b0start:        dw      b0dft
 039E 0001      b1start:        dw      b1dft
 03A0 0010      length:         dw      movcnt
                ;
                ; One-time routine, on 1st BDOS call intercepted
                install:
 03A2 C5                push    b       ;keep everything as it was
 03A3 D5                push    d       ;...so BDOS function can be
 03A4 E5                push    h       ;...completed
 03A5 F5                push    psw
                ; set up restart vector for re-entry
 03A6 3EC3              mvi     a,0c3h  ;a JMP instruction
 03A8 322800            sta     rstv
 03AB 211B00            lxi     h,bankexam
 03AE 222900            shld    rstv+1
                ; set up address of BIOS routine accessed directly
 03B1 2A0100            lhld    biosv           ;find where BIOS is
 03B4 114E00            lxi     d,selmem        ;...and add offset
 03B7 19                dad     d
 03B8 220804            shld    selmv
                ; then patch the RSX prefix to prevent reinstallation
 03BB 2A0A00            lhld    next+1
 03BE 220700            shld    start+1
                ; tell 'em we're ready
 03C1 0E09              mvi     c,printf
 03C3 11D003            lxi     d,imsg
 03C6 CD0900            call    next
 03C9 F1                pop     psw     ;continue with the task that
 03CA E1                pop     h       ;...was so rudely interrupted
 03CB D1                pop     d
 03CC C1                pop     b
 03CD C30900            jmp     next
```

(Continued on page 52)

The First Idea-Processor For Programmers.



FirsTime™

Has features no other editor has.

- Fast program entry through single keystroke statement generators.
- Fast editing through syntax oriented cursor movements.
- Dramatically reduced debugging time through immediate syntax checking.
- Fast development through unique programmer oriented features.
- Automatic program formatter.

FirsTime is a True Syntax Directed Editor.

As the world's most advanced syntax-directed editor, FirsTime lets you work with ideas by taking care of the low-level syntax details of your program. For example, you can generate complete statement skeletons with one keystroke. Move the cursor from one procedure to the next with one keystroke. Type in code, and it's instantly formatted (you specify the rules). Type an error, and FirsTime warns you immediately. You can continue working if you wish. Later, you can use the search-for-error command to find the error and fix it.

FirsTime Has Thorough Error Checking.

FirsTime not only checks your syntax, but also semantics. FirsTime identifies:

- Undefined variables, types and constants.
- Assignment statements with type mismatches.
- Errors in include files and macro expansions.

To Order Call: (201) 741-8188 **or write:**

SPRUCE TECHNOLOGY CORPORATION

P.O. Box 7948
Shrewsbury, NJ 07701

FirsTime is a trademark of Spruce Technology Corporation • MS–DOS is a trademark of Microsoft Corporation • IBM is a trademark of International Business Machines Inc. • Turbo Pascal is a trademark of Borland International • dBase III is a trademark of Ashton-Tate.

FirsTime Lets You Work With Ideas.

The *Zoom command* gives you a top down view of your program logic.

The *View macro command* shows the expansions of a C macro while in the editor.

The *View include file command* instantly shows you the contents of an include file.

The *Transform command* allows you to change a statement to another similar statement, for example, a *FOR* to an equivalent *WHILE*.

The *Search for next error* command allows you to find errors throughout your program.

The *Cursor movement commands* let you traverse your program by logical elements, not just characters.

FirsTime Works With Existing Files.

FirsTime works with standard ASCII files, so you can edit any existing source files.

FirsTime for Turbo Pascal	**$ 74.95**
FirsTime for dBase III	**$125.00**
FirsTime for MS–Pascal	**$245.00**
FirsTime for C	**$295.00**

In Germany, Austria and Switzerland contact:
Markt & Technik Software Verlag
Munchen, W. Germany
(089) 4613-0

Circle **no. 164** on reader service card.

Listing One

```
                ;
03D0 42414E4B53imsg:    db      'BANKSWAP loaded. To access from DDT or '
03F7 5349442074         db      'SID type "G28"'
0405 0D0A24             db      0dh,0ah,'$'
                ;
                ; reuse installation code area for stack space
                locstk:
                ;
                ; uninitialized storage
0408            selmv:  ds      2       ;used for BIOS call to selmem
040A            source: ds      2       ;for moves to buffer
040C            dest:   ds      2       ;for moves from buffer
040E            count:  ds      1       ;blocks to move
040F            holdsp: ds      2       ;stack pointer from DDT or SID
                ;
                buffer:
0411                    ds      buflen
0511                    end
```

End Listing One

Listing Two

```
; RSXMAKER.SUB assemble RSX and attach to existing COM file
; ASW 21 Oct 83
; Usage: A>SUBMIT RSXMAKER <comfile> <asmfile>
;
rmac $2
link $2 [op]
ren $2.rsx=$2.prl
gencom $1 $2
```

End Listing Two

Listing Three

```
Listing Three. An example of the use of BANKSWAP to allow examination of a
        portion of a custom disk drive routine installed in bank 0.
        (Comments added in parentheses).

D>sid
BANKSWAP loaded. To access from DDT or SID type "G28"
CP/M 3 SID - Version 3.0
#g28                                    (go to BANKSWAP)
Bankswap 1.0 by A. S. Woodhull 10/20/83
functions available:
        A...set move Addresses
        G...Get alternate bank
        L...set move Length
        P...Put alternate bank
        Q...Quit to SID or DDT
        X...eXpert mode (no menu)
?? x                                    (remove the menu)
?? a                                    (set up range)
Bank 0 addr: 0100H
Change to? (CR to keep): 7000           (don't accept default)
Bank 1 addr: 0100H
Change to? (CR to keep): 7000
Length is now 1000H
Change to? (CR to keep): <CR>           (length is OK)
?? g                                    (get the data from bank 0)
?? q                                    (back to SID)
Re-enter BANKSWAP from DDT or SID by "G28"
*D61E                                   (we're back)
#d7c00 7c3f                             (examine the data from bank 0)
7C00: C3 09 7C C3 0F 7C C3 15 7C 21 94 0C C3 00 73 21 ..|..|..|!....s!
7C10: 74 0C C3 00 73 21 1B 0C C3 00 73 AE F1 0C A9 04 t...s!....s.....
7C20: D0 2D AE F1 0C AC DF 0C B9 BA 0C 9D 8E C0 AD DE .-..............
7C30: 0C 4A 48 A9 00 2A 0D EF 0C 0D F1 0C A8 B9 80 C0 .JH..*..........
#^C                                     (return to CP/M)
D>
```

End Listings

BRIEF™

"BRIEF, The Programmer's Editor, is simply the best text editor you can buy."

John Dvorak, InfoWorld 7/8/85

Choosing the right program editor is an extremely important decision. After all, more time is spent with your program editor than with any other category of software. A good program editor helps to stimulate creativity and produce programs of superior design. A poor program editor, on the other hand, fights you every step of the way. It can slow you down, get in your way, and make even the simplest tasks difficult.

BRIEF - PROGRAM EDITING *YOUR WAY*

Every programmer has an individual style that makes their work unique. Most program editors compromise that style by forcing the programmer to conform to their methods. Not so with BRIEF.

BRIEF's most powerful feature is its ability to conform to your way of programming. BRIEF can be easily tailored/customized to your individual preferences. For example, keyboard reassignment allows the keyboard to be used in whatever way you prefer. Keystroke macros allow long sequences of editor commands to be repeated by pressing a single key. Plus you can simultaneously work with numerous program and data files, and configure many windows to control BRIEF's visual presentation.

EXPERT USERS OF EVERY MAJOR EDITOR HAVE SWITCHED!

(Call For Details)

"A BONA FIDE UNDO" Steve McMahon - BYTE REVIEW "BUILD YOUR DREAM EDITOR" MARCH 1985

Here are Steve McMahon's exact words: "...BRIEF implements a true undo facility, by default allowing command-by-command recovery from the last 30 commands...The number of commands you want to be able to undo can be changed." (up to 300) "Only with BRIEF, though, was it possible to undo a macro that produced 4000 words of text with a single keystroke."

EVERY FEATURE YOU WANT

BRIEF supports practically every feature you've ever seen, and some you probably haven't thought of yet.

- Edit Multiple Large Files
- Windows (Tiled & Pop-up)
- Unlimited File Size
- Full UNDO (up to 300)
- True Automatic Indent for C
- Exit to DOS Inside BRIEF
- Compile programs inside BRIEF
- Uses All Available Memory
- Online Help
- Tutorial
- Repeat Keystroke Sequences
- 15 Minute Learning
- Reconfigurable Keyboard
- Adjustable line length (up to 512)
- Search for "Regular Expressions"
- Mnemonic Key Assignments
- Horizontal Scrolling
- Comprehensive Error Recovery
- And ... a Complete, Compiled, Programmable and Readable Macro Language.

```
═══════════════════════════ make.c ═══════════════════════════
int        handle = 0;

main (argc, argv■

int             argc;
═══════════ fsa.h ══════════════╦══════════ makefile.h ══════════
#include "..\include\ctype.h"   ║/**
                                ║ **            makefile.h:
typedef  struct                 ║ **
{                               ║ **          This is the definitions fil
   short     action,            ║ **  Hopefully, it won't be unreasonab
             state;             ║ **  that have been written.
} Fsa;                          ║ **/
#ifdef   FSA_MAIN               ║
Fsa      fsa[][8] = {/* Alphanum   Co║typedef struct cmd_struct
                                ║{
/* State 0. */          0, 2,   10║  char          *cmd_text;
/* State 1. */         10, 0,   10║
/* State 2. */          0, 2,    1║  struct cmd_struct *next_cmd;
/* State 3. */          0, 5,   11║} *Cmd_Ptr, Cmd;
/* State 4. */          0, 4,    0,║
Mismatched open parenthesis.         Line: 11   Col: 17      2:17 pm
```

A TYPICAL BRIEF SCREEN

Notice there are three windows on the screen simultaneously and each one is viewing a different file. The mainline of a C program is visible in the uppermost window; the programmer has run a syntax checking macro which found a mismatched open parenthesis in the arguments to the mainline. The other two windows show header files containing information crucial to the design of the program. BRIEF can have an unlimited number of windows and files accessed simultaneously.

BRIEF'S ONLY LIMITATIONS ARE THE ONES *YOU* SET

AVAILABILITY: IBM-PC, AT, Compatibles & TANDY 2000

Try BRIEF with a full 30 day moneyback guarantee.
Only $195. Call 800-821-2492.

Solution Systems™

335-D Washington St., Norwell, MA 02061 (617) 659-1571 **800-821-2492.**

Steve McMahon's quote courtesy Suntype Publishing Systems. BYTE review by Mr. McMahon may be found in BYTE Magazine March 1985.

335-P Washington St., Norwell, MA 02061 (617) 659-1571

Adding a COPY Command to ProDOS

by Shawn Day

If you use ProDOS on an Apple or Apple-compatible system, you may have noticed that you cannot copy files from one volume to another without running FILER and losing any BASIC program you have in memory. I ran across this problem when I tried to copy files to the ProDOS RAM disk from within a BASIC program: I wanted my startup program to load all of the ProDOS editor and assembler files into the RAM disk so that I could have the maximum amount of storage space on my single disk drive and speed up the process of assembling long source files. To solve this problem, I wrote a program that adds a COPY command to ProDOS.

Additional banks of memory can buy you both speed and more usable memory even though your program must reside entirely in one bank.

Using the Program

To add the COPY command to ProDOS, simply type BRUN COPY or use the general-purpose "run" command, -COPY. The code will be installed in memory above the ProDOS file buffers and protected in the system bit map. To execute the command, use the following syntax:

```
COPY pathname1,pathname2
```

A new file (pathname2) will be created, and the contents of the file indicated by pathname1 will be copied into it. You can use this command to make backup copies of any file on the same volume or to copy files from one volume to another. If you are in the process of copying files from one volume to another and no ProDOS prefix has been set, you must specify the complete path name for both files, e.g.,

```
COPY /MYDISK/HELLO,
    /RAM/STARTUP
```

If a ProDOS prefix has been set, it will automatically be prefixed to either path name if required. For example, if the prefix is /RAM/, the command

```
COPY /MYDISK/HELLO,
    STARTUP
```

will copy the file /MYDISK/HELLO to the file /RAM/STARTUP. If the destination file name already exists on the destination volume, the command exits with the DUPLICATE FILENAME error. This prevents accidental erasure of files. If you want to copy a file over an already existing file, use the DELETE command to destroy the existing file and then use the COPY command.

COPY cannot be used to copy files directly from one disk to another if you have only one disk drive. However, if you have a ProDOS RAM disk available to you (that is, you are using an Apple IIc or a IIe with an extended 80-column card) you have the capability to copy the file into the RAM disk and then copy the file again from the RAM disk over to the destination disk.

Shawn Day, 724 Glenburn St., Kelowna, British Columbia V1Y 4G6 Canada

Entering the Program

The source code for COPY is shown in Listing One (page 58). To type in the program, you can either use an assembler or type the hexadecimal numbers in from the monitor. When you are finished, save the program with

```
BSAVE COPY,A$6000,L$2B6
```

How it Works

The COPY code is divided logically into three parts: installation, first-stage processing, and second-stage processing. I will describe the operation of each in turn.

Installation

When COPY is invoked, it relocates itself to reside between the ProDOS BASIC.SYSTEM and its file buffers. A call to GETBUFR with the accumulator containing the value $02 (Listing One, lines 69 and 70) reserves the required two pages of memory. The high byte of the starting address of the reserved space is returned in the accumulator. Line 71 checks to see if the call to GETBUFR was successful. In ProDOS Version 1.0.1 there is a bug in GETBUFR that causes it to return a successful error code whether or not an error occurs. Due to this bug, COPY will only work with ProDOS Version 1.1.1 and later. If you have an earlier version of ProDOS, see your dealer to get an update. If GETBUFR is unsuccessful, the program exits with an appropriate error message (line 72).

Assuming the GETBUFR call was successful, program control is transferred to GOTSPACE (lines 73–83), which protects the acquired memory space via the system bit map and updates RSHIMEM. The routine BITMAPS (lines 135–157) is called twice—once to protect each page. Then the value of RSHIMEM in the BASIC.SYSTEM's global page is decreased by 2 (lines 80–83). This protects the acquired memory from a call to FREBUFR. FREBUFR resets HIMEM to the value contained in RSHIMEM. Because COPY dynamically allocates buffer space during execution via GETBUFR and FREBUFR, it is necessary to perform this

How to go from UNIX to DOS without compromising your standards.

It's easy. Just get an industry standard file access method that works on both.

C-ISAM™ from RDS.

It's been the UNIX™ standard for years (used in more UNIX languages and programs than any other access method), and it's fast becoming the standard for DOS. Why?

Because of the way it works. Its B+ Tree indexing structure offers unlimited indexes. There's also automatic or manual record locking and optional transaction audit trails. Plus index compression to save disk space and cut access times.

How can we be so sure C-ISAM works so well?

We use it ourselves. It's a part of INFORMIX®, INFORMIX-SQL and File-it!™ our best selling database management programs.

For an information packet, call (415) 322-4100. Or write RDS, 4100 Bohannon Drive, Menlo Park, CA 94025.

You'll see why anything less than C-ISAM is just a compromise.

RELATIONAL DATABASE SYSTEMS, INC.

© 1985, Relational Database Systems, Inc. UNIX is a trademark of AT&T. INFORMIX is a registered trademark and RDS, C-ISAM and File-It! are trademarks of Relational Database Systems, Inc.

Circle no. 170 on reader service card.

step. If you wish to have any other added ProDOS commands resident in memory during the execution of COPY, they must each be protected from FREBUFR by this method.

The next program segment (lines 87–95) hooks the COPY command into BASIC.SYSTEM's external command link. Any previously installed external commands are daisy chained by the method described in the *ProDOS Technical Reference Manual.* Lines (99–115) update all internal, nonrelocatable references so that the program will execute properly in its final location. They make use of the table of nonrelocatable references in lines 161–188.

After all the references are adjusted, the code is moved to its final location by the monitor MOVE routine (lines 119–131). This finishes the installation of COPY, and control is passed back to the system.

First-Stage Processing

When ProDOS runs across a command that it does not recognize, it passes control to EXTRNCMD in the BASIC.SYSTEM global page. With COPY installed, this location contains a jump to the relocated copy code (starting at line 203). Here the path-name buffer is checked to see if it contains the COPY command in upper or lower case. If not, the carry flag is set to indicate no match, and control passes to the next user-installed external command (lines 214-215 and 193). If there are no more user-installed commands, line 193 will contain a jump to an RTS instruction. Assuming the COPY command was found, execution continues at line 218, where the command-string length is decremented and stored in XLEN. Lines 220 and 221 store a 0 in XCNUM to indicate to BASIC.SYSTEM that the command is external, and lines 222–225 store the address where second-stage processing is to be resumed after the input string has been parsed by BASIC.SYSTEM. Next, PBITS and PBITS+1 are set to indicate that file creation is allowed, that the command requires two path names, and that the current prefix should be fetched if none is specified in the command string. Finally, the program exits with the carry flag cleared to tell BASIC.SYSTEM that the command has been identified.

Second-Stage Processing

After BASIC.SYSTEM has parsed the command string, control is passed to line 236. At this point, FBITS and FBITS+1 have been set by BASIC.SYSTEM to indicate which parameters were present in the command string. Lines 236–243 check that two path names were given and exit with a syntax error if not.

Assuming both path names were present, execution continues at PARMSOK (line 247), where a GET_FILE_INFO call is made to the MLI (machine-language interface) through the GOSYSTEM vector. This call gets the file information for the source file (the first path name specified in the command string). The file type is checked to make sure it is not a directory or bad block file. (Copying these file types would be meaningless.) If the file is either of these two types, the program exits with a FILE TYPE MISMATCH error.

Next, a new file is created with the file name specified by the second path name in the command line (lines 262–277). If an error occurs during the CREATE attempt, control passes to BADCALL (line 277), where the MLI error is translated to a BASIC.SYSTEM error, the carry flag is set,

Oh, Rapture!
This is truly the editor I have been longing for.

- Dr. Joseph Newcomer

New Epsilon 3.0: fast, *fully programmable* text editor with an EMACS-style command set and concurrent processes!

Presenting Epsilon 3.0, the fastest, most powerful text editor available for personal computers. Epsilon has a built-in programming language, called EEL, for creating your own commands. Plus you get EEL source code for all of Epsilon's commands!

EEL has all the expressive power of the C programming language. It supports all C statements and expressions, pointers and user-defined structures. Unparallelled flexibility!

Because EEL looks like C, commands are easy to write. You don't have to learn a new language. Epsilon detects illegal pointer references, and has a source line single-stepping debugger and EEL profiler, too.

Our amazing Concurrent Process facility lets you run other programs while you continue to edit your files. The program's input and output are connected to a window, so you can edit them. Great for background compiles, debugging while looking at source code, and lots more!

Plus the advanced features programmers need:

- Concurrent Processes
- Multiple Windows
- Unlimited File Size
- Customizable Keyboard
- Tutorial
- Automatic Swap File
- Supports Large Displays
- Saves Deleted Text (n times)
- Context Sensitive Help
- Regular Expression Search
- Unlimited Number of Files
- File Name Completion
- Convenient Keyboard Macros
- Directory Perusal
- Language Support (C, Lisp, etc.)
- Uses All Available Memory

Epsilon runs on IBM PC's, XT's, AT's and compatibles with PC-DOS 2.0 or above and requires 256K of memory.

Epsilon is available directly from Lugaru Software Ltd, and costs only $195.00. Order now using your Visa, MasterCard, or American Express card. Company purchase orders are also welcome. Order it today, so you can enjoy it soon!

Lugaru Software Ltd.
5740 Darlington Road
Pittsburgh, PA 15217
(412) 421-5911

Circle **no. 135** on reader service card.

and an RTS instruction transfers control back to BASIC.SYSTEM. If the CREATE is successful, lines 281–289 attempt to obtain a 1K file buffer from the system for use by the destination file. If the attempt is unsuccessful, the NO BUFFERS AVAILABLE error is generated (lines 284–286).

Finally, the rest of free memory (excluding any resident BASIC programs and any variables that may have values assigned to them) is reserved for the file-transfer buffer (lines 294–316). It is desirable to have as large a buffer as possible in order to speed up the copy. If a very large BASIC program is in memory at the time the COPY command is executed, the file will be copied in several passes because only a small amount of it can be read into memory at one time. If there is no BASIC program in memory, even very large files can be copied in one or two passes. If there is less than one free page of memory, all of the buffer space obtained so far is returned to the system, and the program exits with the NO BUFFERS AVAILABLE error (lines 302–305).

Now that all the buffers are set up, lines 320–331 open the destination file, and lines 335–337 open the source file. Any errors detected during this process cause the buffer space to be returned to the system and an appropriate error message to be generated. Lines 346–351 call NEWLINE to indicate that no NEWLINE character is to be recognized. The NEWLINE character is used by ProDOS when reading a file to signify the end of a line or record. For example, when reading lines from a text file, the NEWLINE character should be set to $8D (carriage return). This allows processing of the file line by line. Because it is desirable to read in as much of the file as possible during each pass, the NEWLINE character is disabled by setting the mask byte to 0 (lines 346 and 347).

Lines 361–378 perform the actual transfer. Lines 363 and 364 call the MLI READ routine to read in as much of the file as possible. An error during the read causes program control to pass to line 366, where the end-of-file condition is checked. If the end of file has been reached, lines 382–401 close both files, free the allocated buffer space, and return control to the system. Otherwise, lines 369–375 write the buffer contents out to the new file and then (assuming no errors were detected during the WRITE) go back for more (line 376). Lines 402–432 are the parameter lists used during the calls to the MLI.

Improvements and Modifications

The most obvious improvement is to allow the use of disk-to-disk copies with a single disk drive. You might also find it useful to allow COPYing a text file to the screen or a printer. Then you would have a general-purpose copy utility, such as CP/M's PIP command.

DDJ

(Listing begins on next page)

Reader Ballot
Vote for your favorite feature/article.
Circle Reader Service **No. 194**.

NEON!™ TURN ON THE FULL POWER OF YOUR MACINTOSH.™

Hidden within your Mac is the programming power, flexibility, and speed to match your imagination. Neon is your key to this object-oriented world. Based on the same design philosophy as the Mac itself, Neon lets you create and command objects – program modules that you build, perfect, and add to your personal collection of tools. In this Smalltalk-like environment, you wield the power to quickly assemble and test ideas, tuning as you go for maximum speed and efficiency. □ Neon works in 128K or dynamically expands for the fattest Mac possible. It is easy to work with from the very beginning. Additional help is provided through the comprehensive manual by Danny Goodman. □ Created by Kriya Systems, Inc. for the development of our Typing Tutor III™ program, Neon is your answer for professional software development. With Neon, there are no licensing fees. Ever. For the MacIntosh developer, Neon is the best choice.

To order your copy of Neon, call 1-800-34KRIYA now with Visa or MasterCard, or send your check to Kriya Systems, Inc., Six Export Drive, Sterling, VA 22170. The price is $155, including shipping and handling.

Neon and Typing Tutor III are trademarks of Kriya Systems, Inc. Apple Macintosh is a trademark of Apple Computers, Inc.

Circle **no. 100** on reader service card.

TURBO GRAPHICS™

for use with

Borlands Turbo Pascal™

A comprehensive set of Pascal procedures and binary routines that includes most of the graphics capabilities found in BASICA in addition to several new graphics routines.

MAJOR FEATURES

(on medium resolution graphics screen)

- Draw large letters, circles, and lines in color.
- Create complicated graphics using DRAW "macros".
- Create and use WINDOWS non-destructively.
- Paint enclosed areas. Get and Put screen memory.
- Scroll any portion of the screen up or down.
- Use the font editor to create letters and graphics characters.
- Combine features to create interesting animations.

Catalog Numbers:
UTIL-100-IBM PC $39.95
UTIL-100-IBM PCjr each

Shipping and Handling:
$5.00 each

Diversified Educational Enterprises, Inc.
725 MAIN STREET
LAFAYETTE, IN 47901
317-742-2690

Circle **no. 118** on reader service card.

ProDos Copy Listing

(Text begins on page 54)

```
0000:                   LST   GEN,VSYM
0000:              ***************************************************
0000:              *                                                 *
0000:              *     COPY Command for ProDOS BASIC.SYSTEM        *
0000:              *                by Shawn Day                     *
0000:              *                                                 *
0000:              *     Syntax: COPY pathname1,pathname2            *
0000:              *                                                 *
0000:              * This command copies the file specified by       *
0000:              * pathname1, to the file specified by pathname2.  *
0000:              * If pathname2 does not exist, it is created.     *
0000:              * If pathname2 does exist, the command exits      *
0000:              * with a DUPLICATE FILENAME error.                *
0000:              *                                                 *
0000:              *     Apple ProDOS Assembler version 1.0          *
0000:              *                                                 *
0000:              ***************************************************
0000:          003C  A1L       EQU   $3C      ;Start address for MOVE
0000:          003D  A1H       EQU   $3D
0000:          003E  A2L       EQU   $3E      ;End address for MOVE
0000:          003F  A2H       EQU   $3F
0000:          0042  A4L       EQU   $42      ;Destination for MOVE
0000:          0043  A4H       EQU   $43
0000:          0073  HIMEM     EQU   $73      ;HIMEM pointer
0000:          00FC  TEMP      EQU   $FC      ;Temporary storage
0000:          00FD  OFFSET    EQU   $FD      ;Offset for relocation code
0000:          00FE  PTR       EQU   $FE      ;Temporary address pointer
0000:          00FE  COUNT     EQU   $FE      ;Temporary storage
0000:          0200  INBUF     EQU   $200     ;Keyboard input buffer
0000:          BE06  EXTRNCMD  EQU   $BE06    ;External cmd jmp vector
0000:          BE09  ERROUT    EQU   $BE09    ;Print error message
0000:          BE50  XTRNADDR  EQU   $BE50    ;External cmd address
0000:          BE52  XLEN      EQU   $BE52    ;Length of cmd string-1
0000:          BE53  XCNUM     EQU   $BE53    ;cmd no. (extrn. cmd = 0)
0000:          BE54  PBITS     EQU   $BE54    ;Command parameter bits
0000:          BE56  FBITS     EQU   $BE56    ;Command parameter bits found
0000:          BE6C  VPATH1    EQU   $BE6C    ;Pathname 1 buffer pointer
0000:          BE6E  VPATH2    EQU   $BE6E    ;Pathname 2 buffer
0000:          BE70  GOSYSTEM  EQU   $BE70    ;Perform MLI call
0000:          BE8B  BADCALL   EQU   $BE8B    ;Translate MLI error to BI error
0000:          BEB4  SSGINFO   EQU   $BEB4    ;GET_FILE_INFO MLI buffer
0000:          BEB7  FIACESS   EQU   $BEB7    ;Access used by lock/unlock
0000:          BEB8  FIFILID   EQU   $BEB8    ;File id of disk file
0000:          BEB9  FIAUXID   EQU   $BEB9    ;Aux id
0000:          BECE  OSYSBUF   EQU   $BECE    ;Buffer for MLI OPEN
0000:          BED0  OREFNUM   EQU   $BED0    ;Reference number of opened file
0000:          BED2  NEWLREF   EQU   $BED2    ;NEWLINE file reference number
0000:          BED3  NLINENBL  EQU   $BED3    ;NEWLINE enable mask and char
0000:          BED6  RWREFNUM  EQU   $BED6    ;Read file reference number
0000:          BED7  RWDATA    EQU   $BED7    ;Read buffer
0000:          BED9  RWCOUNT   EQU   $BED9    ;Read (Number of char requested)
0000:          BEDB  RWTRANS   EQU   $BEDB    ;Read (Number of char transferred)
0000:          BEDE  CFREFNUM  EQU   $BEDE    ;Close file reference number
0000:          BEF5  GETBUFR   EQU   $BEF5    ;Get buffer from system
0000:          BEF8  FREBUFR   EQU   $BEF8    ;Give buffer back to system
0000:          BEFB  RSHIMEM   EQU   $BEFB    ;HIMEM reset value for FREEBUFR
0000:          BF00  MLI       EQU   $BF00    ;MLI entry point
0000:          BF58  BITMAP    EQU   $BF58    ;System bit map table
0000:          FE2C  MOVE      EQU   $FE2C    ;Monitor MOVE routine
----- NEXT OBJECT FILE NAME IS COPY
6000:          6000            ORG   $6000
6000:              *-----------------------------------------------
6000:              * Installation
6000:              *-----------------------------------------------
6000:              *
6000:              *       Get some space for the COPY code
6000:              *       and protect it by updating the system bit map
6000:              *
6000:AD 03 61                  LDA   PAGES       ;Number of pages needed
6003:20 F5 BE                  JSR   GETBUFR     ;Ask the BI for some space
6006:90 03     600B            BCC   GOTSPACE    ;We got the space
6008:4C 09 BE                  JMP   ERROUT      ;Couldn't find space
600B:48              GOTSPACE  PHA                ;Save start address
600C:AE 03 61                  LDX   PAGES       ;Number of pages to protect
600F:20 73 60        PROTECT   JSR   BITMAPS     ;Protect a page
6012:18                        CLC
6013:69 01                     ADC   #$01        ;Point to next page
6015:CA                        DEX                ;Are we done?
6016:D0 F7     600F            BNE   PROTECT     ;If not
6018:AD FB BE                  LDA   RSHIMEM     ;Protect code from FREEBUFR
601B:38                        SEC
601C:ED 03 61                  SBC   PAGES
601F:8D FB BE                  STA   RSHIMEM
6022:              *
6022:              *       Hook routine into the ProDOS external command vector
6022:              *
6022:AE 07 BE                  LDX   EXTRNCMD+1  ;Set link to next external command
6025:AC 08 BE                  LDY   EXTRNCMD+2  ;or RTS (whichever was already there)
6028:8E 01 61                  STX   LINK+1
602B:8C 02 61                  STY   LINK+2
602E:A9 0E                     LDA   #>START     ;Install the address of the
6030:8D 07 BE                  STA   EXTRNCMD+1  ;COPY command handler in the
6033:68                        PLA                ;external command jump vector
6034:48                        PHA                ;Save start address for MOVE
6035:8D 08 BE                  STA   EXTRNCMD+2
6038:              *
6038:              *       Update all non-relocatable references in the COPY code
6038:              *
6038:38                        SEC                ;Find offset to be added to all
6039:E9 61                     SBC   #<LINK      ;non-relocatable references
603B:85 FD                     STA   OFFSET
603D:A2 00                     LDX   #$00        ;Index start of table
603F:A0 00                     LDY   #$00
6041:18                        CLC
```

(Continued on page 60)

Another in a series of productivity notes on MS-DOS™ software from UniPress.

TEXT EDITING

UNIPRESS EMACS™

Subject: Multi-window full screen editor.

Multiple windows allow several files (or portions of the same file) to be edited simultaneously. Programmable through macros and the built-in compiled MLISP™ extension language.

Features:

- Famed Gosling version.
- Extensible through macros and the built-in compiled MLISP extension language.
- Dozens of source code MLISP functions; including C, Pascal, LISP and MLISP syntax checking.
- EDT and simple WordStar™ emulation modes.
- MS-DOS commands can be executed with output placed in an EMACS window.
- Run a compile on your program and EMACS will point to any errors for ease of debugging.
- EMACS runs on the IBM-PC™ (XT/AT), TI-PC,™ DEC Rainbow 100+,™ HP-150™ or any other MS-DOS machine. Requires at least 384K.

Price:

EMACS binary	$325
EMACS source	995
One month trial	75

Also available for UNIX™ and VMS.™
Call for pricing.

ISAM FILE SYSTEM REPORT WRITER & QUERY LANGUAGE

PHACT™

Subject: Powerful keyed file access, report generator and query language for MS-DOS.

PHACT Isam is a keyed B+ tree file manager providing easy access to and manipulation of records in a database. PHACT-report produces formatted reports from PHACT databases. PHACT-query is a high level tool for manipulating data in PHACT databases.

Features:

- Supports fixed and variable length records (1-9999 bytes).
- Up to 9 alternate indices are supported.
- Record locking allows multiple simultaneous updates.
- Records can be accessed on full or partial key.
- Includes full Lattice™ linkable library and high-level functions.
- PHACT-report, an easy-to-use command language for formatting reports from existing PHACT databases.
- PHACT-query can be used for making ad hoc and "canned" inquiries into a PHACT database.

Price:

PHACT ISAM	single-user	$295
	multi-user	450
PHACT-report	single-user	165
	multi-user	275
PHACT-query	single-user	195
	multi-user	495

Source code available. Call for terms.
Also available for UNIX and VMS.
Call for pricing.

COMMUNICATIONS

PCworks™

New from UniPress!

Subject: Communication network for PCs.

PCworks connects PCs to a variety of computers and information services.

Features:

- PCworks connects your PC to other PCs/Macintoshes™ or UNIX/VMS systems for file transfer and command serving.
- Menu driven for ease of use. Telephone numbers and other parameters can be stored.
- Transfer ASCII or binary files, send/receive electronic mail, or submit and print jobs in conjunction with UNIX or VAX™/VMS hosts.
- PC files can be printed on another system.
- Terminal Emulators include: ANSI, TTY, VT100/52.
- Protocol: error-free data transfers utilizing packet sequence numbers and checksums, or XMODEM protocol.
- Supports many modems/autodialers at a wide range of speeds.

Price:

PCworks	$195
The Connectable Networks™	Call for pricing.

For our **Free Catalogue** and more information on these and other software products, call or write: UniPress Software, Inc.; 2025 Lincoln Hwy., Edison, NJ 08817. Telephone: (201) 985-8000. **Order Desk: (800) 222-0550 (Outside NJ).** Telex 709418. European Distributor: Modulator SA, Switzerland Telephone: 41 31 59 22 22, Telex: 911859

OEM terms available.
Mastercard/Visa accepted.

See our ad in the next issue for more MS-DOS products, including Lattice C compiler and Ps-Make.

Trademarks of: UniPress EMACS and MLISP, UniPress Software, Inc.; WordStar, MicroPro Intl. Corp.; MS-DOS and IBM-PC, IBM.; TI-PC, Texas Instruments; PHACT, PHACT Associates; Lattice, Lattice, Inc.; UNIX, AT&T Bell Laboratories; VAX/VMS, DEC Rainbow 100+, Digital Equipment Corp; HP-150, Hewlett-Packard Co. MACLine, UniHost, PCworks and The Connectables Network, Touchstone Software, Corp; Macintosh, Apple Computer, Inc.

UniPress Software

Circle no. 77 on reader service card.

C POWER

FUNCTION LIBRARY
C WINDOWS
SUPERFONTS FOR C
B-TREE LIBRARY
ISAM DRIVER
C-TERP INTERPRETER

LIBRARY: *325 fully tested functions screen handling/graphic, cursor/ keyboard/data entry, string handling, status and control, utility/DOS/BIOS/ time/date, printer control. More & Better Functions! 4 disks, 400 page manual* *$129.95*

WINDOWS: *The most powerful windowing package available, overlays, borders, pop-up menus/ help windows, zap instantly on/off screen, status lines, horizontal/ vertical scrolling, color control/ highlighting, word-wrap, files to windows, keyboard to windows 3 disks, 225 page manual* *$129.95*

SUPERFONTS FOR C: *Dramatic, high impact screens. Use our character & image libraries and functions, or create your own. Font & Function LIbrary* *$49.95*

B-TREE LIBRARY: *Fast indexing B-tree. 16 million each: keys and records, unlimited keys per file, variable length records, configurable key sizes. PC-DOS, UNIX, XENIX, CP/M.* *$79.95*

ISAM DRIVER: *$49.95*

COMPATIBILITY: *PC/XT/AT & compatibles; Full K&R, CI-C86/De Smet/ Lattice/Microsoft 3.0/Aztec/ others. BEST YOU CAN GET!*

VALUE: *All source code, No royalties, on packages above.*

C-TERP: *Simply the best C interpreter available. See C Journal Summer 1985*
C-TERP (specify compiler) *$299.95*

COMBINE AND SAVE!

C LIBRARY plus C WINDOWS
BOTH for only $179.95
+ SUPERFONTS FOR C . $199.95
+ B-TREE and ISAM $299.95
(A $440 VALUE)
C LIBRARY plus C WINDOWS
+ SUPERFONTS
+ C-TERP (a $610 value) $459.95
All (a $740 value) $549.95

Entelekon

12118 Kimberley, Houston, TX 77024
713-468-4412
VISA-MASTECARD-CHECK

Circle no. **92** on reader service card.

ProDos Copy Listing

(Listing continued, text begins on page 54)

```
6042:BD 91 60       RELOCATE  LDA    RELTABLE,X      ;Point to non-relocatable reference
6045:85 FE                    STA    PTR
6047:BD 92 60                 LDA    RELTABLE+1,X
604A:85 FF                    STA    PTR+1
604C:B1 FE                    LDA    (PTR),Y         ;Add offset to the reference
604E:65 FD                    ADC    OFFSET
6050:91 FE                    STA    (PTR),Y
6052:E8                       INX                     ;Index next reference
6053:E8                       INX
6054:EC C7 60                 CPX    TABLESIZE       ;Number of references times 2
6057:90 E9    6042            BCC    RELOCATE
6059:               *
6059:               *         Move the code to its final home
6059:               *
6059:A2 00                    LDX    #>LINK          ;Start
605B:A0 61                    LDY    #<LINK
605D:86 3C                    STX    A1L
605F:84 3D                    STY    A1H
6061:A2 AB                    LDX    #>END           ;End
6063:A0 62                    LDY    #<END
6065:86 3E                    STX    A2L
6067:84 3F                    STY    A2H
6069:A0 00                    LDY    #$00            ;Destination (Always on a page boundary)
606B:84 42                    STY    A4L
606D:68                       PLA                     ;We saved the high byte on the stack
606E:85 43                    STA    A4H
6070:4C 2C FE                 JMP    MOVE            ;Y-reg=$00
6073:               *
6073:               *         Subroutine to update system bit map
6073:               *
6073:A8             BITMAPS   TAY                     ;Save page address
6074:48                       PHA
6075:8A                       TXA                     ;Save X-reg
6076:48                       PHA
6077:98                       TYA                     ;Restore page address
6078:4A                       LSR    A               ;Divide page address by 8
6079:4A                       LSR    A
607A:4A                       LSR    A
607B:AA                       TAX                     ;Load X-reg with page address/8
607C:98                       TYA                     ;Restore page address
607D:29 07                    AND    #$07            ;Kill off the high order bits
607F:A8                       TAY                     ;and put it in the Y-reg
6080:A9 00                    LDA    #$00            ;Zero the mask
6082:38                       SEC                     ;Prepare to put a 1 into mask
6083:6A             BITMAPS1  ROR    A               ;Rotate carry into mask
6084:88                       DEY
6085:10 FC    6083            BPL    BITMAPS1        ;Rotate mask to proper position
6087:1D 58 BF                 ORA    BITMAP,X        ;Update the actual bitmap
608A:9D 58 BF                 STA    BITMAP,X
608D:68                       PLA                     ;Restore X-reg and A-reg
608E:AA                       TAX
608F:68                       PLA
6090:60                       RTS
6091:               *
6091:               *         Table of non-relocatable references
6091:               *
6091:1F 61          RELTABLE  DW     RELOC1+2
6093:24 61                    DW     RELOC2+2
6095:2C 61                    DW     NXTCHR2+2
6097:3E 61                    DW     RELOC3+1
6099:78 61                    DW     FILEOK+2
609B:7E 61                    DW     RELOC4+2
609D:84 61                    DW     RELOC5+2
609F:89 61                    DW     RELOC6+2
60A1:8F 61                    DW     RELOC7+2
60A3:95 61                    DW     RELOC8+2
60A5:9B 61                    DW     RELOC9+1
60A7:AE 61                    DW     RELOC10+2
60A9:B3 61                    DW     RELOC11+2
60AB:D6 61                    DW     RELOC12+2
60AD:DF 61                    DW     RELOC13+2
60AF:E7 61                    DW     RELOC14+2
60B1:ED 61                    DW     RELOC15+2
60B3:F3 61                    DW     RELOC16+2
60B5:F9 61                    DW     RELOC17+1
60B7:3B 62                    DW     TRANSFER+2
60B9:3E 62                    DW     RELOC18+2
60BB:51 62                    DW     RELOC19+2
60BD:57 62                    DW     RELOC20+2
60BF:5D 62                    DW     RELOC21+1
60C1:74 62                    DW     RELOC22+2
60C3:77 62                    DW     RELOC23+2
60C5:7D 62                    DW     RELOC24+1
60C7:36             TABLESIZE DFB    TABLESIZE-RELTABLE
60C8:         0038  FILLPAGE  DS     >0-FILLPAGE     ;Fill to next page boundary
6100:               *-----------------------------------------------
6100:               * The following is the COPY command code.
6100:               *-----------------------------------------------
6100:4C 00 00       LINK      JMP    $0000           ;Address planted to next command
6103:02             PAGES     DFB    <END-LINK+256   ;Number of pages occupied
6104:04 43 4F 50    CMDSTRU   STR    "COPY"          ;This is the command string
6108:59
6109:04 63 6F 70    CMDSTRL   STR    "copy"          ;Accept upper or lower case
610D:79
610E:               *-----------------------------------------------
610E:               * Check to see if the command is COPY. If not,
610E:               * then check for next user command, or tell ProDOS
610E:               * it is not a user command. If it is the COPY
610E:               * command, then set up for first stage processing.
610E:               *-----------------------------------------------
610E:AD 6C BE       START     LDA    VPATH1          ;Get command line pointer
6111:85 FE                    STA    PTR
6113:AD 6D BE                 LDA    VPATH1+1
6116:85 FF                    STA    PTR+1
```

(Continued on page 62)

Prospero's FIPS-validated Pascal language compiler system

PRO PASCAL *works*

WE SPECIALISE IN WRITING COMPILERS

Small or Large

Choice of small or large model 8086 code

Used at 3000 sites around the world

Lazy I/O

All files closed on exit from procedure

8087

Optional 8087 support included

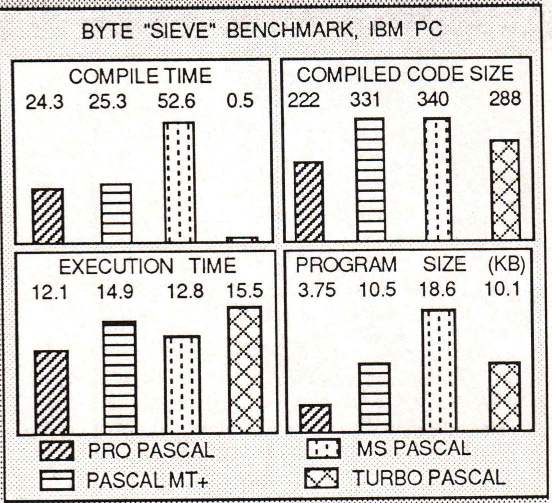
"Superb Quality"

Validated to ANSI/IEEE 770X3.97 Class A on the IBM Personal Computer - the only validated Pascal compiler available for the PC and other 8086 family machines!

NO BUGS YOU DON'T HAVE TO FILL IN ALL THE HOLES

7/16 digit — Single and double precision IEEE format arithmetic

Pro Pascal allows chaining and execution of other programs.



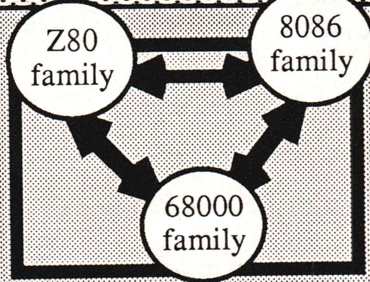
Produces compact efficient code

U.S.A. Distributed by Lifeboat Ass NY and Programmer's Shop MA

Lazy Overlaying

Unique fluid overlaying technique loads non-resident routines automatically

Compiles BIG programs . . . .
>10000 lines... >1000 identifiers....
Separate compilation to build libraries and massive program suites



Portable source code

$390.00

To buy call London 01-741 8531. Visa, Amex, Mastercard & Diners accepted.

Powerful symbolic debugger included

Display and alter variables. Show source as program runs, or on request. Break on variables or procedure calls. Show calling nest.

Prospero Software

Languages For Microcomputer Professionals

190 Castelnau, London SW13 9DH, England telephone 01-741 8531 telex 8814396

Circle **no. 62** on reader service card.

EARTH LAUNCHES NEW STARS

EARTH COMPUTERS launches two of the "Hottest" new stars in the S-100 Universe. Both the **TURBOMASTER 8**™ and **TURBOSLAVE I**™ are Star performers, featuring high speed Z-80H CPUs.

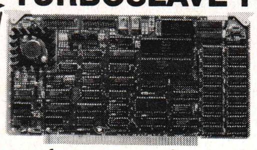
EARTH's new stars are fully compatible with the Multi-user TurboDOS operating system, and will operate in most S-100 systems, including pre-IEEE 696 systems.

TURBOMASTER 8

This outstanding new 8-Bit Single Board Computer offers features that are out of this world:

- On-board ST-506 Winchester Controller
- TurboDOS, CP/M, MP/M compatible
- 5-¼″ and 8″ Floppy Controller
- Up to 256KB of memory
- 2 Serial ports
- 8 MHz, Z-80H CPU
- 1 Parallel port

TURBOSLAVE I

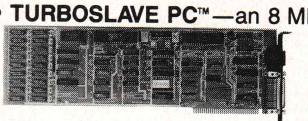


The perfect companion to the TURBOMASTER 8 or other 8/16-Bit Master processor. This high speed slave utilizes an 8 MHz Z-80H CPU and offers extensive on-board diagnostics... an industry exclusive.

- No paddle boards
- S-100, IEEE 696 compatible
- 128KB of RAM
- 2 RS-232 ports, 50–38.4K Baud
- FIFO communications

EARTH COMPUTERS also manufacturers a growing line of PC compatible stellar performers such as:

- **TURBOSLAVE PC**™—an 8 MHz



Z-80 single board slave processor that runs CP/M applications on a PC and is compatible with the TurboDOS multi-user operating system.

- **TURBOACCEL 286**™—a high performance 80286 accelerator that boosts PC performance up to five times.
- **EARTHNET PC**™ and **EARTHNET S-100,** the low cost, ARCNET-compatible way to tie PC and S-100 systems together.

To put these stars to work for you, call or write EARTH COMPUTERS. **BE SURE TO ASK ABOUT HOW YOU CAN WIN A FREE Z-80 CO-PROCESSOR BOARD.**

EARTH COMPUTERS

"Building Blocks For The Super Micro"

P.O. Box 8067, Fountain Valley, CA 92728
TELEX: 910 997 6120 EARTH FV
PHONE: (714) 964-5784

Circle **no. 179** on reader service card.

ProDos Copy Listing

(Listing continued, text begins on page 54)

```
6118:A0 00          207           LDY   #$00          ;Index command string
611A:C8             208 NXTCHR    INY                  ;Increment index
611B:B1 FE          209           LDA   (PTR),Y       ;Get character from input string
611D:D9 04 61       210 RELOC1    CMP   CMDSTRU,Y     ;Does it match upper case?
6120:F0 08    612A  211           BEQ   NXTCHR2       ;If yes
6122:D9 09 61       212 RELOC2    CMP   CMDSTRL,Y     ;Does it match lower case?
6125:F0 03    612A  213           BEQ   NXTCHR2       ;If yes
6127:38             214           SEC                  ;Flag match failure
6128:B0 D6    6100  215           BCS   LINK          ;Go to next command in the chain
612A:CC 04 61       216 NXTCHR2   CPY   CMDSTRU       ;Checked all characters?
612D:D0 EB    611A  217           BNE   NXTCHR        ;No, so check the next one
612F:88             218           DEY                  ;Put command length-1 in XLEN
6130:8C 52 BE       219           STY   XLEN
6133:A9 00          220           LDA   #$00          ;Mark command as external
6135:8D 53 BE       221           STA   XCNUM
6138:A9 4E          222           LDA   #>SECOND      ;Point to command handler
613A:8D 50 BE       223           STA   XTRNADDR
613D:A9 61          224 RELOC3    LDA   #<SECOND
613F:8D 51 BE       225           STA   XTRNADDR+1
6142:A9 0B          226           LDA   #$0B          ;Allow CREATE, require two pathnames
6144:8D 54 BE       227           STA   PBITS
6147:A9 04          228           LDA   #$04          ;Fetch prefix, if required
6149:8D 55 BE       229           STA   PBITS+1
614C:18             230           CLC                  ;No errors so far
614D:60             231           RTS                  ;Return to BASIC.SYSTEM
614E:               232 *-----------------------------------------------
614E:               233 * COPY second stage processing. First check FBITS
614E:               234 * to see if the proper parameters were present.
614E:               235 *-----------------------------------------------
614E:AD 56 BE       236 SECOND    LDA   FBITS         ;Parameters found
6151:4A             237           LSR   A             ;Filename found?
6152:90 03    6157  238           BCC   SYNERROR      ;No, so give error message
6154:4A             239           LSR   A             ;Second filename found?
6155:B0 04    615B  240           BCS   PARMSOK       ;Yes, so go do command
6157:A9 10          241 SYNERROR  LDA   #$10          ;Syntax error
6159:38             242 MLIERR    SEC                  ;Set carry to show error
615A:60             243 RETURN    RTS                  ;Return to system
615B:               244 *
615B:               245 *         Both filenames were given, so execute COPY
615B:               246 *
615B:A9 0A          247 PARMSOK   LDA   #$0A          ;Set up GET_FILE_INFO call
615D:8D B4 BE       248           STA   SSGINFO
6160:A9 C4          249           LDA   #$C4          ;MLI GET_FILE_INFO code
6162:20 70 BE       250           JSR   GOSYSTEM      ;Perform the MLI call
6165:B0 F3    615A  251           BCS   RETURN        ;If error, return carry set
6167:AD B8 BE       252           LDA   FIFILID       ;Get file type
616A:C9 0F          253           CMP   #$0F          ;Can't copy a directory file
616C:F0 04    6172  254           BEQ   MISMATCH
616E:C9 01          255           CMP   #$01          ;Can't copy a bad block file
6170:D0 04    6176  256           BNE   FILEOK
6172:A9 0D          257 MISMATCH  LDA   #13           ;FILE TYPE MISMATCH error
6174:D0 E3    6159  258           BNE   MLIERR        ;Always
6176:               259 *
6176:               260 *         File type is OK
6176:               261 *
6176:8D 93 62       262 FILEOK    STA   CRFILID       ;File type for CREATE
6179:AD B9 BE       263           LDA   FIAUXID       ;File aux type for CREATE
617C:8D 94 62       264 RELOC4    STA   CRAUXID
617F:AD BA BE       265           LDA   FIAUXID+1
6182:8D 95 62       266 RELOC5    STA   CRAUXID+1
6185:A9 C3          267           LDA   #$C3          ;File access (UNLOCKED)
6187:8D 92 62       268 RELOC6    STA   CRACCESS      ;We have to be able to write!
618A:AD 6E BE       269           LDA   VPATH2        ;Pathname for CREATE
618D:8D 90 62       270 RELOC7    STA   CRPATH
6190:AD 6F BE       271           LDA   VPATH2+1
6193:8D 91 62       272 RELOC8    STA   CRPATH+1
6196:20 00 BF       273 CREATE    JSR   MLI           ;Create the new file
6199:C0             274           DFB   $C0           ;MLI CREATE command code
619A:8F 62          275 RELOC9    DW    CRPARMS       ;CREATE parameter list
619C:90 03    61A1  276           BCC   SUCCESS       ;CREATE successful
619E:4C 8B BE       277           JMP   BADCALL       ;Translate to BI error code and exit
61A1:               278 *
61A1:               279 *         Create a file buffer for the destination file
61A1:               280 *
61A1:A9 04          281 SUCCESS   LDA   #$04          ;1K buffer required
61A3:20 F5 BE       282           JSR   GETBUFR       ;Get space
61A6:90 04    61AC  283           BCC   RELOC10
61A8:A9 0C          284           LDA   #$0C          ;NO BUFFERS AVAILABLE error
61AA:38             285           SEC
61AB:60             286           RTS
61AC:8D 9F 62       287 RELOC10   STA   OPEN2BUF+1
61AF:A9 00          288           LDA   #$00          ;Buffer always on page boundary
61B1:8D 9E 62       289 RELOC11   STA   OPEN2BUF
61B4:               290 *
61B4:               291 *         Create a transfer buffer for the file
61B4:               292 *         Use as much free memory as possible
61B4:               293 *
61B4:A9 FF          294 TRANSBUF  LDA   #$FF          ;Count how many pages we can get
61B6:85 FE          295           STA   COUNT         ;Initialize with -1
61B8:E6 FE          296 GETMORE   INC   COUNT         ;Count how many pages
61BA:A9 01          297           LDA   #$01          ;Get one page at a time
61BC:20 F5 BE       298           JSR   GETBUFR       ;Get space
61BF:90 F7    61B8  299           BCC   GETMORE       ;Keep going until we can't get more
61C1:A5 FE          300           LDA   COUNT         ;Check how many pages we got
61C3:D0 07    61CC  301           BNE   GOTENOUGH     ;Any non-zero number is okay
61C5:20 F8 BE       302           JSR   FREBUFR       ;Give back the allocated memory
61C8:A9 0C          303           LDA   #$0C          ;NO BUFFERS AVAILABLE error
61CA:38             304           SEC
61CB:60             305           RTS
61CC:8D DA BE       306 GOTENOUGH STA   RWCOUNT+1     ;Save buffer size
61CF:A9 00          307           LDA   #$00          ;Length is always an even number of page
61D1:8D D9 BE       308           STA   RWCOUNT
61D4:AD 9F 62       309 RELOC12   LDA   OPEN2BUF+1    ;Get start address of buffer
61D7:38             310           SEC
```

(Continued on page 66)

NEW !!

TURBO
INTEGRATED DEVELOPMENT SYSTEM

NEW !!

These systems were developed from the ground up to work in an integrated fashion ... This saves you time and money from trying to assemble different packages and to code in our Products Unique Features.

TURBO ISAM MASTER

GENERATES 'Ready to Run' Turbo Programs Using BORLAND'S Turbo Pascals Database TOOLBOX.

With a few key strokes you can generate the following Pascal programs/includes files. Automatically interfaces to Turbo Screen Master.

A. MASTER DATABASE PROGRAM - Generates Pascal Program Code for the following functions.

1. Add a Record ● Allows both duplicate & unique only keys. ● Change the up to 6 fields comprising the primary key and the up to 3 secondary keys at any time during input, and the validity of the keys are checked and the ISAM key files are automatically adjusted.

2. Delete a Record - Shows the record to be deleted on the screen and allows you to change your mind about deleting, and then adjusts the keys files automatically for the up to 4 keys. The disk space is reused automatically by the programs.

3. Edit a Record - with a key change allowed.

4. Search Database by Key - Up to 4 keys-and has a 1 key lookup to find next key in alphabetic order.

5. For Each Key - The ability to display the keys on the screen or printer in sorted order.

B. DATA BASE RECOVERY PROGRAM. This program recovers your data base if it is corrupted by a power outage or certain hardware failures.

C. MULTIPLE ISAM FILES - ·Can be used at the same time in a single program. The generator also produces context sensitive instructions on how to integrate the generated program into your main program.

D. DOCUMENTATION - Print screens and ISAM specifications. Also inline program documentation is generated.

TURBO MENU MASTER

GENERATES 'Ready to Run' Turbo Programs with Dedicated Screens or Windows.

Features: Has Menu Data Base so its easy to modify menues. **Provides Selection by - (1) Press of a number**-If you have more than 9 selections then you enter only a single number if the selection is 2-9. **(2) Press of a function key** - If more than 10 selec tions then can enter use shift function key to get up to 18 selections. **(3) Press the High Lighted Letter** -in the selection description, you choose a letter for each menu selection in the interactive menu generator. **(4) Use the arrow keys** - to point to a menu item & then press return.

Adaptive Screen Colors -Different screen colors are automatically used for color or monochrome display. This allows you to provide a better interface for the user.

Interactive Menu Builder - (1) Allows for the automatic entry & reorder of selections. (2) Offers easy color selection. (3) Allows for choice of procedure, chain, execute or comment code generation for each selection. (4) Has startup Menu that YOU design. (5) Provides for the integrated Display & Control of the Key Lock Status.

RISK FREE TRIAL

Try the demo package included for 30 days. If not pleased return for a full refund.

NO ROYALTIES on Generated Programs

Credit card orders call:

1-800-821-9503

In Florida (800) 342-0137

HAWAIIAN VILLAGE COMPUTER SOFTWARE
1109 Pennsylvania Ave. St. Cloud, Florida 32769

Circle no. 133 on reader service card.

TURBO SCREEN MASTER

Some of the **UNIQUE** features of the **Turbo Screen Generator** are:

Intelligent Cursor - Computer automatically determines which single/double character to use from the Extended IBM Character set to draw boxes and borders. You just move the cursor where you want the border. The other Screen Systems require that you must tediously choose the correct graphic character.

Extended Variable Names - Allows the use of Structures & Arrays in your variable names and automatically generates the correct declarations and initalization routines. Also you are allowed to declare a field larger than the screen display size.

Provides Three Color Selections Methods - Easy to develop color screen on Monochrome Monitor and to develop Monochrome Screens on the Color Monitor.

Adaptive Screen - Entry colors change automatically depending on what type of screen is in use.

COMPARISON WITH OTHER PRODUCTS	TURBO SCREEN MASTER	TURBO SCREEN VER - 1.10	SCREEN SCULPTURE Ver - 1.01
Border Color Control	YES	NO	NO
You Assign Variable Names	YES	NO	YES
No cyptic variable names whose names depend on where they appear on screen			
Range and Date Checks	YES	NO	YES
Data Entry Valid Character Set	YES	NO	NO
Data Entry Mask	YES	NO	YES
Helpful for Profession Screen input & Validation			
Initalize Variables to a starting value	YES	NO	YES
Data Entry Valid String Set	YES	NO	NO
Pascal storage for type of Boolean & Integer	YES	YES	NO
Control Capa/Num Look	YES	NO	NO
Auto-Initalization of Date/Time	YES	NO	NO
User Defined Error & Message Handler	YES	NO	NO
Generated program adapts automatically to IBM Screen-Monitor Type	YES	NO	YES
Handles Function Keys	YES	NO	NO
Help Screen Procedures	YES	YES	NO
Optional ISAM Keys Screens Code Generated automatically	YES	NO	NO
Turbo Toolkit Included	YES	NO	NO
Undo Function	YES	NO	NO
Provides Running Time Display	YES	NO	NO
Integrated Data Dictionary	YES	NO	NO
Auto-start Screen for Screen Generation	YES	NO	NO
PRICE (INCLUDES SHIPPING)	$89.95	54.95	125.00

FREE TURBO TOOL KIT $44.95 VALUE

WITH ORDER OF A MASTER PRODUCT

YES, Enclosed is __________

INTRODUCTORY OFFER

☐ Turbo Pascal 3.0	~~$69.95~~	$59.95
☐ Turbo Database Tool Box	~~$54.95~~	$49.95
☐ Turbo Menu Master	~~$69.95~~	$54.95
☐ Turbo Screen Master	~~$124.95~~	$89.95
☐ Turbo ISAM Master	~~$149.95~~	$124.95

Systems Requires: IBM PC,XT,AT or 100% Compatiable -196K. MS DOS 2.0 or Higher - 80 column screen. Turbo Pascal 3.0 - 2 DD/DS Disk Drives. ISAM Program Generator Requires Turbo Database Toolbox.

*These prices include shipping to all U.S. Cities. All foreign orders add $10 per product ordered

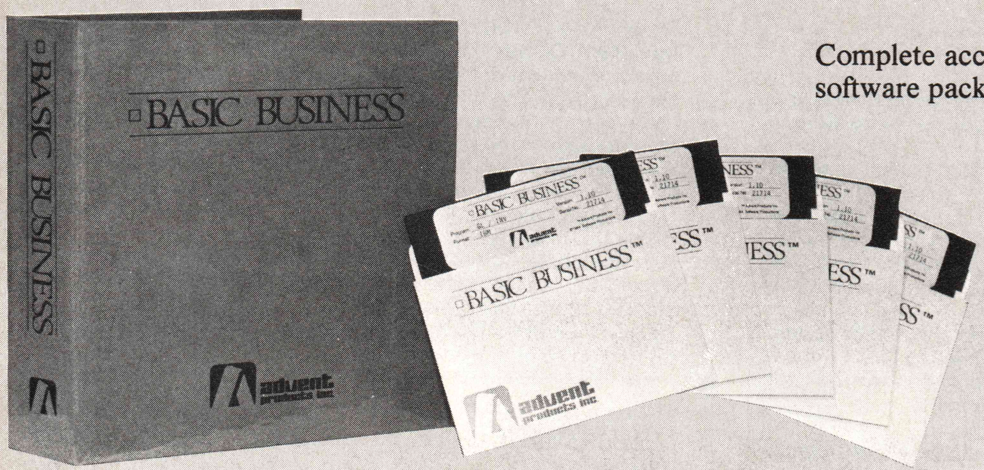
For Other Inquires Call (305) 892-5686

Name: __________ **Phone:** __________
Shipping Address: __________
City: __________ **State:** __________ **Zip:** __________
VISA or MC #: __________ **Exp. Date:** __________

C.O.D.'s and Purchase orders WILL NOT be accepted. Outside USA: make payment by bank draft payable in US dollars drawn on a US bank.

©Turbo Pascal & Turbo Database Toolbox are trademarks of Borland International. IBM is a trademark of International Business Machines. MS-DOS is a trademark of Microsoft. Turbo Screen is a copywrite of Pascom Computing. Screen Sculpture is a trademark of the Software Bottling Co of New York. ©1985 Hawaiian Village Computer Software.

TIMELY REPORTS, ACCURATE RECORDS, RELIABLE INFORMATION......



Complete accounting software package, only **$89.95**

......this is BASIC BUSINESS

Price is nice - and so is a long list of features - but when you choose a software package to automate your accounting, don't lose sight of the basics of good business record keeping. Basic Business, an all-in-one accounting software package consisting of General Ledger, Accounts Receivable, Accounts Payable, Payroll, Inventory Control, Sales Order Processing, and Purchase Order Processing. It offers an excellent price and extensive feature list without sacrificing these basic business principles:

Full Audit Trails - to give you complete confidence in the accuracy of your data and provide crucial backup information when you need it. And double entry accounting keeps your books in balance.

Complete Integration - provides efficient processing for all your business transactions, updating all of your accounting records instantaneously. You only enter the transaction once, and all supporting modules are updated automatically.

Flexibility - Basic Business can be adapted to your way of doing business, including balance forward or open item accounts receivable, departmental or consolidated general ledger, variable aging periods and easy entry of manually written checks and voids.

Extensive Reporting - each accounting module provides complete reports, including master lists, transactions, journals, statements and forms. In addition, all data files are compatible with Ashton-Tate's dBase II and dBase III, for the ultimate in custom reporting capability.

With some accounting software, even packages costing hundreds of dollars more, you must make detailed estimates and complex calculations for the maximum number of customers, transactions, inventory items, etc., before using the system. Then, when your business grows to exceed these original estimates, you must repeat this process.

Not with Basic Business! All data files are automatically initialized when you install the system on your computer. Files can grow dynamically as your business increases and areusually limited only by the amount of you exceed your original estimates.

FORMS ARE NO PROBLEM! Basic Business uses standard forms for invoices, statements, checks, purchase orders, etc., which may be ordered with your company name, adddress and logo imprinted.

Basic Business is one of a family of accounting and business software packages, and has sold previously for several hundred dollars per module. It has been improved, updated and re-packaged to sell at a market-busting $89.95 for all seven modules. A Point-of-Purchase module, which controls an electronic cash drawer and allows direct entry of transactions from your sales counter is available. Also a dBase file format program is available for importing Basic Business data files into dBase II/III for custom report generation or other special uses.

SOURCE CODE AVAILABLE

Do you have a distinct accounting problem that off-the-shelf software won't handle? Special forms or statements? Don't write your own accounting system from the ground up - start with Basic Business. Call (714) 630-0446 for all the details on source code licensing.

Basic Business can go to work for you today and is available for most popular MS-DOS (IBM and compatibles) and CP/M-80 personal computers. Compare our price, features and attention to detail. There is only one choice. . . it's Basic Business.

Basic Business	$89.95
Point-of-Purchase module	.$99.95
dBase II/III file formats	$19.95

Minimum hardware Required for MS-DOS : 128K memory, two 360K floppy drives (hard disk recommended for Sales and Purchase Order Processing), 132 column printer, MS-DOS (or PC-DOS) version 2.0 or later.

Minimum Hardware Required for CP/M-80 computers: 80 x 24 character display terminal, 64K memory, two 360K disk drives (hard disk recommended for Sales and Purchase Order Processing), 132 column printer.

SERVICES

File Transfer Service: Advent provides a service beyond the ability of any format conversion software! We can transfer files between MS-DOS/PC-DOS, CP/M and other operating systems in 300 different 3 1/2", 5 1/4" and 8" formats. Includes Apple and Mac, Apricot, Data General One, Kaypro 2000, Eagle, Epson QX-10 & PX-8 (ROM), HP-150, and North Star computers.

ENGINEERING SOFTWARE

ACNAP: A stand-alone Electronics Circuit Analysis Program for use with passive and active circuits consisting of resistors, capacitors, inductors, transistors, op-amps, FETs, etc. Features menu driven and very fast processing times with circuits saved to disk for later use or editing.
ACNAP (CP/M & MS-DOS) **$69.95**

DCNAP: Stand-alone DC circuit analysis program for use with passive and active circuits containing resistors, voltage sources, independent and dependent current sources. Fast, menu- driven program with circuit saved to disk for later use or editing.
DCNAP (CP/M & MS-DOS) **$69.95**

Plotpro: Scientific graph printing program. Prints on 80 or 132 column printer. Create linear, semi-logarithmic, and full logarithmic plots with one or two Y axes in auto or forced scale.
Plotpro (CP/M & MS-DOS) **$69.95**

SPP: This Signal Processing Program contains an integrated set of routines which analyze linear and non-linear systems and circuits and their effects on user specified time domain waveforms. Based on a 512 point Fast Fourier Transform and its inverse. Linear processing is in frequency domain and non-linear processing is in time domain.
SPP (CP/M & MS-DOS) **$69.95**

SOFTWARE UTILITIES

Autodiff: File difference detector. This program finds insertions, deletions, and changes between any two files. Autodiff can mark the file, display, or print the differences, and more!
Autodiff (CP/M) **$29.95**

CP/M DateStamper: Automatically stamp your files with the date it is created, last read, or modified. Works without a Real Time Clock, or with many clocks currently on the market. Utilities are included to allow copying, erasing, or renaming files based on time and date. A time logging utility is included to record computer usage for business/tax purposes.
DateStamper (CP/M) **$49.95**

Media Master +: Read and Write up to 75 CP/M, MS-DOS & TRSDOS disk formats on your IBM or look-alike computer. ZP/EM program is bundled with Media Master to allow CP/M programs to run directly on your MS-DOS computer. An $80.00 value.
Media Master + ... **$59.95**

Pack and Crypt: Two program set. Pack compresses and expands files on disk to save space. Crypt encodes files to provide security for sensitive data. Both are ideal for use with modem transfers.
Pack and Crypt (CP/M & MS-DOS) **$24.95**

Sidekick: One of the most popular programs ever written. Use Sidekick as a calculator, notepad, appointment calendar, auto dialer, ASCII conversion table and much more. On-line help if you forget any of Sidekick's many functions.
Sidekick (MS-DOS) **$54.95**

SmartKey II: New Release! Same great time saver as the original, and allows compiling of definitions you set up with your word-processor! Makes every software program you use easier. Can reduce keystrokes by more than 50% by redefining any key on your keyboard to be any combination of characters or commands that you desire.
SmartKey II **$49.95**

SmartPrint: A powerful add-on to SmartKey, SmartPrint is a vesatile writing tool designed to give you full access to your printer's features such as wide, bold, condensed, underlined, subscript, superscript, and more. Works great with programs like WordStar and others.
SmartPrint **$29.95**

Uniform: Your Computer can read and write up to 80 CP/M, MS-DOS / PC-DOS & TRSDOS disk formats. Versions available for most popular CP/M and MS-DOS computers. Specify your host computer when ordering.
Uniform (CP/M & MS-DOS) **$69.95**

XTREE: Directory maintenance program that graphically displays subdirectories and filename paths. Complete control of your directory including delete, rename, view, list or show. A must for your IBM or compatible.
XTREE (MS-DOS) **$49.95**

Super Zap: Disk patch and dump program. If you have used DU, you will love this menu driven marvel!
Super Zap (CP/M) **$24.95**

ZP/EM: Run almost any CP/M program on your IBM or clone. Use with Media Master or Uniform to allow programs on CP/M disk formats to run directly on your IBM or compatible computer.
ZP/EM (MS-DOS) **$39.95**

FX, QX-10, PX-8 - Epson Corp; CP/M - DRI; MS-DOS - MicroSoft; PC-DOS - IBM Corp.; dBASE II & dBase III - Ashton-Tate; WordStar - MicroPro; UNIX - Bell Laboratories; Apple - Apple Computer Inc.; Basic Business - Advent Products Inc.

PROGRAMMING LANGUAGES

C/80 Ver 3.1: Full featured C compiler and runtime library. One of the fastest on the market. Mathpak is included for true 32 bit floating point and signed integers.
C/80 Ver. 3.1 (CP/M) **$79.90**

C/NIX: Operating System Enhancement for CP/M. C/NIX gives your system many features in the UNIX OS such a hierarchical directory, I/O redirection, "pipes" & "filters" and command files. Uses only 2.3K of TPA and 42K of disk. Requires CP/M 2.x.
C/NIX **$59.95**

LISP/80: Experiment with the artificial intelligence language. Based on the INTERLISP dialect, LISP/80 offers over 75 built-in functions, including file I/O, and string operations. Complete with 36 page manual and demo programs.
LISP/80 .... **$39.95**

Toolworks C: This compiler is a complete subset of C. The two- pass compiler produces relocatable object files (.obj) which are compatible with the MS-DOS LINK program. Mathpak is included for true 32 bit floating point and signed integers.
Toolworks C Compiler (MS-DOS) **$79.90**

Turbo Pascal: Borland version 3.0. The best Pascal compiler on the market.
Turbo Pascal (CP/M & MS-DOS) **$69.95**

Turbo Toolbox: Set of 3 utilities for use with Turbo Pascal.
Turbo Toolbox (CP/M & MS-DOS) **$54.95**

Turbo Tutor: Teaches step-by-step how to use Turbo Pascal.
Turbo Tutor (CP/M & MS-DOS) **$34.95**

Turbo Graphics: Provides full graphics management for producing windows, pie and pie charts, circles and other geometric shapes with Turbo Pascal.
Turbo Graphics (MS-DOS) **$54.95**

TEXT EDITING

Punctuation & Style: Improves your writing by catching unbalanced quotes, parentheses and brackets, improper abbreviations, capitalization, sentence structure, much more. It's like having your own copy editor!
Punctuation & Style (CP/M & MS-DOS) **$125.00**

Word Finder: This powerful 90,000 word Thesaurus allows you to select the best word for the application. Works inside WordStar for greater ease of use. Instantly searches its dictionary, then displays synonyms, and automatically deletes the "wrong" word and replaces it with the "right" word. Requires 380K disk storage.
Word Finder (CP/M) **$79.95**

Wordpatch: Print files with tiny, compressed, wide, or wide compressed type faces, 5 sizes of italic, real superscripts and subscripts, and 6, 7, and 8 lines per inch spacing. No new print controls to learn. Supports most popular dot matrix printers. A must for WordStar users!
Wordpatch (CP/M & MS-DOS) **$49.95**

The Word Plus: The ultimate spelling checker. Not only finds misspelled words but shows you correct spelling options, shows the word in context, allows you to build dictionaries of special words you use, and much more.
The Word Plus (MS-DOS) **$150.00**

HARDWARE & SUPPLIES

Finger Print "Letter Writer": Unleash your Epson FX series printer. Add near-letter-quality print, IBM and/or Apple Graphics printer emulation, plus 16 other print functions! Three replacement chips quickly fit inside Epson FX series printers. Easy installation. Does not void printer warranty.
Finger Print "LetterWriter" **$79.95**

Diskettes, Double Density:

Maxell 10-pack w/ storage box:		3M box of 10:	
Single Sided	**$19.95**	**Single Sided**	**$22.95**
Double Sided	**$23.95**	**Double Sided**	**$26.95**

Economy Diskettes: package of 25 including tyvek sleeves.
Single Sided **$29.50**
Double Sided **$31.25**

Call or write for our FREE catalog

All items are warranteed for 90 days. 30 day money back guarantee if not completely satisfied. Guarantee for software applies only if diskette seal is intact. Visa and MasterCard are welcome. Please add 2.00 freight per total order and 2.00 for COD orders. California residents please add 6% sales tax. Prices, availability and specifications subject to change without notice.

CALL TODAY **National (800) 821-8778**
California (800) 521-7182

Hours: Mon - Fri 8 am - 5 pm PDT

DEALER INQUIRIES WELCOME.

advent products inc.
3154-F E. La Palma Ave.
Anaheim, CA 92806
(714) 630-0446

Circle no. 176 on reader service card.

LISP FOR THE IBM PERSONAL COMPUTER.

THE PREMIER LANGUAGE OF ARTIFICIAL INTELLIGENCE FOR YOUR IBM PC.

- **DATA TYPES**
  - Lists and Symbols
  - Unlimited Precision Integers
  - Floating Point Numbers
  - Character Strings
  - Multidimensional Arrays
  - Files
  - Machine Language Code
- **MEMORY MANAGEMENT**
  - Full Memory Space Supported
  - Dynamic Allocation
  - Compacting Garbage Collector
- **FUNCTION TYPES**
  - EXPR/FEXPR/MACRO
  - Machine Language Primitives
  - Over 190 Primitive Functions
- **IO SUPPORT**
  - Multiple Display Windows
  - Cursor Control
  - All Function Keys Supported
  - Read and Splice Macros
  - Disk Files
- **POWERFUL ERROR RECOVERY**
- **8087 SUPPORT**
- **COLOR GRAPHICS**
- **LISP LIBRARY**
  - Structured Programming Macros
  - Editor and Formatter
  - Package Support
  - Debugging Functions
  - .OBJ File Loader
- **RUNS UNDER PC-DOS 1.1 or 2.0**

IQLISP

5¼" Diskette and Manual ________ $175.00

Integral Quality

P.O. Box 31970
Seattle, Washington 98103-0070
(206) 527-2918

Washington State residents add sales tax.
VISA and MASTERCARD accepted.
Shipping included for prepaid orders.

ProDos Copy Listing

(Listing continued, text begins on page 54)

```
61D8:E5 FE                         SBC   COUNT
61DA:8D D8 BE                      STA   RWDATA+1        ;Save buffer start address
61DD:8D A4 62          RELOC13     STA   WR2BUF+1
61E0:A9 00                         LDA   #$00            ;Buffer starts on a page boundary
61E2:8D D7 BE                      STA   RWDATA
61E5:8D A3 62          RELOC14     STA   WR2BUF
61E8:                  *
61E8:                  *           Open the destination file
61E8:                  *
61E8:AD 6E BE                      LDA   VPATH2          ;Pathname pointer
61EB:8D 9C 62          RELOC15     STA   OPEN2PATH
61EE:AD 6F BE                      LDA   VPATH2+1
61F1:8D 9D 62          RELOC16     STA   OPEN2PATH+1
61F4:20 00 BF                      JSR   MLI             ;Perform MLI call
61F7:C8                            DFB   $C8             ;MLI OPEN command code
61F8:9B 62             RELOC17     DW    OPEN2PARM
61FA:90 08    6204                 BCC   OPENSRC         ;No errors, so open the source file
61FC:48                            PHA                    ;Save error code
61FD:20 F8 BE                      JSR   FREBUFR         ;Release buffer
6200:68                            PLA                    ;Restore error code
6201:4C 8B BE                      JMP   BADCALL         ;Translate error code and exit
6204:                  *
6204:                  *           Open source file
6204:                  *
6204:A5 74             OPENSRC     LDA   HIMEM+1         ;Get buffer start
6206:8D CF BE                      STA   OSYSBUF+1       ;(use general purpose buffer)
6209:A9 00                         LDA   #$00            ;Buffer always on a page boundary
620B:8D CE BE                      STA   OSYSBUF
620E:A9 C8                         LDA   #$C8            ;MLI open code
6210:20 70 BE                      JSR   GOSYSTEM        ;Perform the MLI call
6213:B0 1D    6232                 BCS   ERRORET         ;Exit if error detected
6215:AD D0 BE                      LDA   OREFNUM         ;Set up file reference number
6218:8D D2 BE                      STA   NEWLREF         ;For NEWLINE call
621B:8D D6 BE                      STA   RWREFNUM        ;For READ call
621E:8D DE BE                      STA   CFREFNUM        ;For CLOSE call
6221:A9 00                         LDA   #$00            ;Set up NEWLINE call
6223:8D D3 BE                      STA   NLINENBL        ;to disable NEWLINE char
6226:A9 0D                         LDA   #$0D            ;Non-zero
6228:8D D4 BE                      STA   NLINENBL+1
622B:A9 C9                         LDA   #$C9            ;MLI NEWLINE code
622D:20 70 BE                      JSR   GOSYSTEM        ;Perform the MLI call
6230:90 07    6239                 BCC   TRANSFER        ;If no errors detected
6232:48                ERRORET     PHA                    ;Save error code
6233:20 65 62                      JSR   CLEANUP         ;Close files and free buffer
6236:68                            PLA                    ;Restore error code
6237:38                            SEC                    ;Flag error
6238:60                            RTS                    ;Return to system
6239:                  *
6239:                  *           Both files are now open so perform transfer
6239:                  *
6239:AD A0 62          TRANSFER    LDA   OPEN2REF        ;Set up WRITE file reference number
623C:8D A2 62          RELOC18     STA   WR2REF
623F:A9 CA             XFERLOOP    LDA   #$CA            ;MLI READ code
6241:20 70 BE                      JSR   GOSYSTEM        ;Perform the MLI call
6244:90 06    624C                 BCC   XFEROK          ;No errors
6246:C9 05                         CMP   #$05            ;End of file?
6248:F0 1B    6265                 BEQ   CLEANUP         ;Yes, so clean up and exit
624A:D0 E6    6232                 BNE   ERRORET         ;Exit with appropriate error
624C:AD DB BE          XFEROK      LDA   RWTRANS         ;Number of bytes transferred
624F:8D A5 62          RELOC19     STA   WR2REQ          ;Request to write these bytes
6252:AD DC BE                      LDA   RWTRANS+1
6255:8D A6 62          RELOC20     STA   WR2REQ+1
6258:20 00 BF                      JSR   MLI             ;Write the data to the destination file
625B:CB                            DFB   $CB             ;MLI WRITE code
625C:A1 62             RELOC21     DW    WR2PARMS
625E:90 DF    623F                 BCC   XFERLOOP
6260:20 8B BE                      JSR   BADCALL         ;Translate to BI error code
6263:B0 CD    6232                 BCS   ERRORET         ;Always
6265:                  *-------------------------------------------------------
6265:                  * Close open files and free the allocated buffer space
6265:                  *-------------------------------------------------------
6265:A9 00             CLEANUP     LDA   #$00            ;Default to no errors detected
6267:85 FC                         STA   TEMP
6269:A9 CC                         LDA   #$CC            ;MLI CLOSE code
626B:20 70 BE                      JSR   GOSYSTEM        ;Close source file
626E:90 02    6272                 BCC   RELOC22         ;If no error detected
6270:85 FC                         STA   TEMP            ;Update error
6272:AD A0 62          RELOC22     LDA   OPEN2REF        ;Close destination file
6275:8D AA 62          RELOC23     STA   CLOSE2REF
6278:20 00 BF                      JSR   MLI             ;Perform the MLI call
627B:CC                            DFB   $CC             ;MLI CLOSE code
627C:A9 62             RELOC24     DW    CL2PARMS        ;CLOSE parameter list
627E:90 05    6285                 BCC   FREE            ;If no error detected
6280:20 8B BE                      JSR   BADCALL         ;Translate to BI error
6283:85 FC                         STA   TEMP            ;Update error
6285:20 F8 BE          FREE        JSR   FREBUFR         ;Deallocate file buffer
6288:18                            CLC                    ;Default to no errors detected
6289:A5 FC                         LDA   TEMP            ;Error code in A
628B:F0 01    628E                 BEQ   RET             ;Zero if no errors
628D:38                            SEC                    ;Flag error
628E:60                RET         RTS
628F:                  *-------------------------------------------------------
628F:                  * Parameter list for CREATE
628F:                  *-------------------------------------------------------
628F:07                CRPARMS     DFB   $07             ;Parameter count
6290:         0002     CRPATH      DS    2               ;Pointer to pathname
6292:         0001     CRACCESS    DS    1               ;Access permitted byte
6293:         0001     CRFILID     DS    1               ;File type
6294:         0002     CRAUXID     DS    2               ;File aux type
6296:01                            DFB   $01             ;Standard file (Not directory)
6297:00 00             CRDATE      DFB   $00,$00         ;Create date
6299:00 00             CRTIME      DFB   $00,$00         ;Create time
629B:                  *-------------------------------------------------------
629B:                  * Parameter list for OPEN
629B:                  *-------------------------------------------------------
```

(Continued on page 68)

Tools That Make Your Job Easier

For PCDOS/MSDOS (2.0 and above/128K) • IBM PC/Compatibles, PC Jr., Tandy 1000/1200/2000, & others
For CPM80 2.2/3.0 (Z80 required/64K) • 8″ SSSD, Kaypro 2/4, Osborne I SD/DD, Apple II, & others

MIX EDITOR

Programmable, Full/Split Screen Text Processor

Introductory Offer **29**^{95}

Great For All Languages

A general purpose text processor, the MIX Editor is packed with features that make it useful with any language. It has auto indent for structured languages like Pascal or C. It has automatic line numbering for BASIC (255 character lines). It even has fill and justify for English.

Split Screen

You can split the screen horizontally or vertically and edit two files simultaneously.

Custom Key Layouts

Commands are mapped to keys just like WordStar. If you don't like the WordStar layout, it's easy to change it. Any key can be mapped to any command. You can also define a key to generate a string of characters, great for entering keywords.

Macro Commands

The MIX Editor allows a sequence of commands to be executed with a single keystroke. You can define a complete editing operation and perform it at the touch of a key.

Custom Setup Files

Custom keyboard layouts and macro commands can be saved in setup files. You can create a different setup file for each language you use.

MSDOS Features

Execute any DOS command or run another program from inside the editor. You can even enter DOS and then return to the editor by typing exit.

MIX C COMPILER

Full K&R Standard C Language
Unix Compatible Function Library

Introductory Offer **39**^{95}

Complete & Standard

MIX C is a complete and standard implementation of C as defined by Kernighan and Ritchie. Coupled with a Unix compatible function library, it greatly enhances your ability to write portable programs.

The Best C Manual

MIX C is complemented by a 400 page manual that includes a tutorial. It explains all the various features of the C language. You may find it more helpful than many of the books written about C.

Fast Development

MIX C includes a fast single pass compiler and an equally fast linker. Both are executed with a simple one line command. Together they make program development a quick and easy process.

Fast Execution

The programs developed with MIX C are fast. For example, the often quoted prime number benchmark executes in a very respectable 17 seconds on a standard IBM PC.

Standard Functions

In addition to the functions described by K&R, MIX C includes the more exotic functions like *setjmp* and *longjmp*. Source code is also included.

Special Functions

MIX C provides access to your machine's specific features through BDOS and BIOS functions. The CHAIN function lets you chain from one program to another. The MSDOS version even has one function that executes any DOS command string while another executes programs and returns.

Language Features

- Data Types: char, short, int, unsigned, long, float, double (MSDOS version performs BCD arithmetic on float and double-no roundoff errors)
- Data Classes: auto, static, extern, register
- Struct, Union, Bit Fields (struct assignment supported)
- Typedef, Initialization
- All operators and macro commands are supported

30 DAY MONEY BACK GUARANTEE

Orders Only: **Call Toll Free 1-800-523-9520,** (Texas only **1-800-622-4070**)

MIX Editor ____ $29.95 + shipping ($5 USA/$10 Foreign) Texas residents add 6% sales tax
MIX C ____ $39.95 + shipping ($5 USA/$25 Foreign) Texas residents add 6% sales tax

Visa ____ MasterCard ____ Card # ________________ Exp. Date ________
COD ____ Check ____ Money Order ____ Disk Format ________________
Computer ________________ Operating System: MSDOS ____ PCDOS ____ CPM80 ____
Name ________________
Street ________________
City/State/Zip ________________
Country ________________
Phone ________________

MIX software
2116 E. Arapaho
Suite 363
Richardson, Tx 75081

Dealer Inquiries Welcome
Call (214) 783-6001

MSDOS is a trademark of Microsoft PCDOS is a trademark of IBM CPM80 is a trademark of Digital Research WordStar is a trademark of MicroPro

D

Instant-C™: The *Fastest* Interpreter for C

Runs your programs 50 to 500 times faster than any other C language interpreter.

Any C interpreter can save you compile and link time when developing your programs. But only ***Instant-C*** saves your time by running your program at compiled-code speed.

Fastest Development. A program that runs in one second when compiled with an optimizing compiler runs in two or three seconds with ***Instant-C***. Other interpreters will run the same program in two minutes. Or even ten minutes. Don't trade slow compiling and linking for slow testing and debugging. *Only* ***Instant-C*** *will let you edit, test, and debug at the fastest possible speeds.*

Fastest Testing. ***Instant-C*** immediately executes any C expression, statement, or function call, and display the results. Learn C, or test your programs faster than ever before.

Fastest Debugging. ***Instant-C*** gives you the best source-level debugger for C. Single-step by source statement, or set any number of conditional breakpoints throughout your program. Errors always show the source statements involved. Once you find the problem, test the correction in seconds.

Fastest Programming. ***Instant-C*** can directly generate executable files, supports full K & R standard C, comes with complete library source, and works under PC-DOS, MS-DOS, or CP/M-86. ***Instant-C*** *gives you working, well-tested programs faster than any other programming tool.* Satisfaction guaranteed, or your money back in first 31 days. ***Instant-C*** is $495.

Rational
Systems, Inc.
P.O. Box 480
Natick, MA 01760
(617) 653-6194

Circle no. **145** on reader service card.

ProDos Copy Listing

(Listing continued, text begins on page 54)

```
629B:03            416 OPEN2PARM DFB   $03           ;Parameter count
629C:         0002 417 OPEN2PATH DS    2             ;Pointer to pathname
629E:         0002 418 OPEN2BUF  DS    2             ;Pointer to I/O buffer
62A0:         0001 419 OPEN2REF  DS    1             ;File reference number
62A1:              420 *-----------------------------------------------
62A1:              421 * Parameter list for WRITE
62A1:              422 *-----------------------------------------------
62A1:04            423 WR2PARMS  DFB   $04           ;Parameter count
62A2:         0001 424 WR2REF    DS    1             ;File reference number
62A3:         0002 425 WR2BUF    DS    2             ;File transfer buffer
62A5:         0002 426 WR2REQ    DS    2             ;Number of bytes to transfer
62A7:         0002 427 WR2TRANS  DS    2             ;Number of bytes transferred
62A9:              428 *-----------------------------------------------
62A9:              429 * Parameter list for CLOSE
62A9:              430 *-----------------------------------------------
62A9:01            431 CL2PARMS  DFB   $01           ;Parameter count
62AA:         0001 432 CLOSE2REF DS    1             ;File reference number
62AB:         62AB 433 END       EQU   *


   3D A1H            3C A1L             3F A2H             3E A2L
   43 A4H            42 A4L           BE8B BADCALL       6083 BITMAPS1
 6073 BITMAPS      BF58 BITMAP         BEDE CFREFNUM      62A9 CL2PARMS
 6265 CLEANUP      62AA CLOSE2REF      6109 CMDSTRL       6104 CMDSTRU
   FE COUNT        6292 CRACCESS       6294 CRAUXID      ?6297 CRDATE
?6196 CREATE       6293 CRFILID        628F CRPARMS       6290 CRPATH
?6299 CRTIME       62AB END            6232 ERRORET       BE09 ERROUT
 BE06 EXTRNCMD     BE56 FBITS         ?BEB7 FIACESS       BEB9 FIAUXID
 BEB8 FIFILID      6176 FILEOK         60C8 FILLPAGE      BEF8 FREBUFR
 6285 FREE         BEF5 GETBUFR        61B8 GETMORE       BE70 GOSYSTEM
 61CC GOTENOUGH    600B GOTSPACE         73 HIMEM        ?0200 INBUF
 6100 LINK         6172 MISMATCH       BF00 MLI           6159 MLIERR
 FE2C MOVE         BED2 NEWLREF        BED3 NLINENBL      611A NXTCHR
 612A NXTCHR2        FD OFFSET         629E OPEN2BUF      629B OPEN2PARM
 629C OPEN2PATH    62A0 OPEN2REF       6204 OPENSRC       BED0 OREFNUM
 BECE OSYSBUF      6103 PAGES          615B PARMSOK       BE54 PBITS
 600F PROTECT        FE PTR            61AC RELOC10       61B1 RELOC11
 61D4 RELOC12      61E5 RELOC14        611D RELOC1        61DD RELOC13
 61EB RELOC15      61F1 RELOC16        61F8 RELOC17       623C RELOC18
 624F RELOC19      6255 RELOC20        625C RELOC21       6272 RELOC22
 6275 RELOC23      6122 RELOC2         627C RELOC24       613D RELOC3
 617C RELOC4       6182 RELOC5         6187 RELOC6        618D RELOC7
 6193 RELOC8       619A RELOC9         6042 RELOCATE      6091 RELTABLE
 628E RET          615A RETURN         BEFB RSHIMEM       BED9 RWCOUNT
 BED7 RWDATA       BED6 RWREFNUM       BEDB RWTRANS       614E SECOND
 BEB4 SSGINFO      610E START          61A1 SUCCESS       6157 SYNERROR
 60C7 TABLESIZE      FC TEMP          ?61B4 TRANSBUF      6239 TRANSFER
 BE6C VPATH1       BE6E VPATH2         62A3 WR2BUF        62A1 WR2PARMS
 62A2 WR2REF       62A5 WR2REQ        ?62A7 WR2TRANS      BE53 XCNUM
 623F XFERLOOP     624C XFEROK         BE52 XLEN          BE50 XTRNADDR

   3C A1L            3D A1H             3E A2L             3F A2H
   42 A4L            43 A4H               73 HIMEM           FC TEMP
   FD OFFSET         FE PTR               FE COUNT       ?0200 INBUF
 600B GOTSPACE     600F PROTECT        6042 RELOCATE      6073 BITMAPS
 6083 BITMAPS1     6091 RELTABLE       60C7 TABLESIZE     60C8 FILLPAGE
 6100 LINK         6103 PAGES          6104 CMDSTRU       6109 CMDSTRL
 610E START        611A NXTCHR         611D RELOC1        6122 RELOC2
 612A NXTCHR2      613D RELOC3         614E SECOND        6157 SYNERROR
 6159 MLIERR       615A RETURN         615B PARMSOK       6172 MISMATCH
 6176 FILEOK       617C RELOC4         6182 RELOC5        6187 RELOC6
 618D RELOC7       6193 RELOC8        ?6196 CREATE        619A RELOC9
 61A1 SUCCESS      61AC RELOC10        61B1 RELOC11      ?61B4 TRANSBUF
 61B8 GETMORE      61CC GOTENOUGH      61D4 RELOC12       61DD RELOC13
 61E5 RELOC14      61EB RELOC15        61F1 RELOC16       61F8 RELOC17
 6204 OPENSRC      6232 ERRORET        6239 TRANSFER      623C RELOC18
 623F XFERLOOP     624C XFEROK         624F RELOC19       6255 RELOC20
 625C RELOC21      6265 CLEANUP        6272 RELOC22       6275 RELOC23
 627C RELOC24      6285 FREE           628E RET           628F CRPARMS
 6290 CRPATH       6292 CRACCESS       6293 CRFILID       6294 CRAUXID
?6297 CRDATE      ?6299 CRTIME         629B OPEN2PARM     629C OPEN2PATH
 629E OPEN2BUF     62A0 OPEN2REF       62A1 WR2PARMS      62A2 WR2REF
 62A3 WR2BUF       62A5 WR2REQ        ?62A7 WR2TRANS      62A9 CL2PARMS
 62AA CLOSE2REF    62AB END            BE06 EXTRNCMD      BE09 ERROUT
 BE50 XTRNADDR     BE52 XLEN           BE53 XCNUM         BE54 PBITS
 BE56 FBITS        BE6C VPATH1         BE6E VPATH2        BE70 GOSYSTEM
 BE8B BADCALL      BEB4 SSGINFO       ?BEB7 FIACESS       BEB8 FIFILID
 BEB9 FIAUXID      BECE OSYSBUF        BED0 OREFNUM       BED2 NEWLREF
 BED3 NLINENBL     BED6 RWREFNUM       BED7 RWDATA        BED9 RWCOUNT
 BEDB RWTRANS      BEDE CFREFNUM       BEF5 GETBUFR       BEF8 FREBUFR
 BEFB RSHIMEM      BF00 MLI            BF58 BITMAP        FE2C MOVE
** SUCCESSFUL ASSEMBLY := NO ERRORS
** ASSEMBLER CREATED ON 15-JAN-84 21:28
** TOTAL LINES ASSEMBLED   433
** FREE SPACE PAGE COUNT   79
```

End Listing

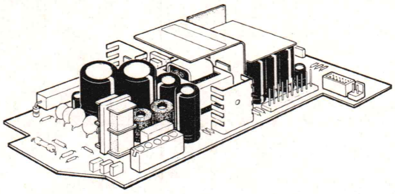
ALL SALES ARE MADE SUBJECT TO THE TERMS OF OUR 90 DAY LIMITED WARRANTY. A COPY OF THIS WARRANTY

DIGITAL RESEARCH COMPUTERS

(214) 225-2309

Switching Power Supply!

+ 5VDC - 8 Amps
+12VDC - 5 Amps
-12VDC - 1 Amp
(81 WATTS MAX)



$29.95 ea.

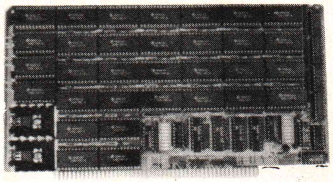
4 FOR $99

ADD $2 EA. UPS

BRAND NEW UNITS, MFG. BY BOSCHERT FOR HEWLETT PACKARD! PERFECT FOR SMALL COMPUTER AND DISK DRIVE APPLICATIONS #XL81-5630. INPUT 110V/220V, 50/60 HZ. NOMINAL OUTPUTS: +5VDC @ 8A, +12VDC @ 5A, -12VDC @ 1A. TOTAL MAX OUTPUT. MUST BE LIMITED TO 81 WATTS TOTAL! (WITH PIN OUT SHEET.) ORIGINAL FACTORY BOXED.

64K S100 STATIC RAM

$119.00 KIT



LOW POWER!

150 NS ADD $10

BLANK PC BOARD WITH DOCUMENTATION $49.95

SUPPORT ICs + CAPS $17.50

FULL SOCKET SET $14.50

FULLY SUPPORTS THE NEW IEEE 696 S100 STANDARD (AS PROPOSED)

FOR 56K KIT $105

ASSEMBLED AND TESTED ADD $50

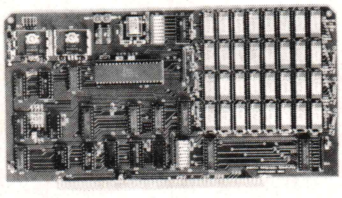
PRICE CUT!

FEATURES:
* Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
* Fully supports IEEE 696 24 BIT Extended Addressing.
* 64K draws only approximately 500 MA.
* 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
* SUPPORTS PHANTOM (BOTH LOWER 32K AND ENTIRE BOARD).
* 2716 EPROMs may be installed in any of top 48K.
* Any of the top 8K (E000 H AND ABOVE) may be disabled to provide windows to eliminate any possible conflicts with your system monitor, disk controller, etc.
* Perfect for small systems since BOTH RAM and EPROM may co-exist on the same board.
* BOARD may be partially populated as 56K.

256K S-100 SOLID STATE DISK SIMULATOR!

WE CALL THIS BOARD THE "LIGHT-SPEED-100" BECAUSE IT OFFERS AN ASTOUNDING INCREASE IN YOUR COMPUTER'S PERFORMANCE WHEN COMPARED TO A MECHANICAL FLOPPY DISK DRIVE.

PRICE CUT!



FEATURES:
* 256K on board, using + 5V 64K DRAMS.
* Uses new Intel 8203-1 LSI Memory Controller.
* Requires only 4 Dip Switch Selectable I/O Ports.
* Runs on 8080 or Z80 S100 machines.
* Up to 8 LS-100 boards can be run together for 2 Meg. of On Line Solid State Disk Storage.
* Provisions for Battery back-up.
* Software to mate the LS-100 to your CP/M* 2.2 DOS is supplied.
* The LS-100 provides an increase in speed of up to 7 to 10 times on Disk Intensive Software.
* Compare our price! You could pay up to 3 times as much for similar boards.

BLANK PCB (WITH CP/M* 2.2 PATCHES AND INSTALL PROGRAM ON DISKETTE) $69.95 (8203-1 INTEL $29.95)

(ADD $50 FOR A&T) $149.00

#LS-100 (FULL 256K KIT)

PANASONIC

Green Screen - Video Monitors

25 MHZ. TYPICAL BANDWIDTH!!!

Brand New In The Box! 9-Inch Screen

#K-904B1 (Chassis #Y08A) Open Frame Style

$29.95 EA.

GROUP SPECIAL: 4 for $99.00 WITH DATA & SCHEMATIC

(USA SHIPPING: $3. PER UNIT. CANADA: $7. PER UNIT)

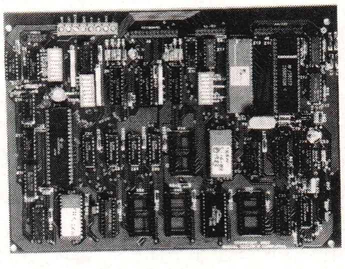
COMPUTER MANUFACTURER'S EXCESS. STILL IN ORIGINAL PANASONIC BOXES. THE CRT TUBE ALONE WOULD COST MORE THAN OUR PRICE FOR THE COMPLETE UNIT. FOR SPLIT VIDEO (TTL INPUTS) OPERATION, NOT COMPOSITE VIDEO. OPERATES FROM 12VDC AT 1 AMP. VERTICAL INPUT IS 49 TO 61 HZ. HORIZONTAL INPUT: 15,750 HZ ± 500 HZ. RESOLUTION IS 800 LINES AT CENTER 650 LINES AT CORNERS.

THE NEW ZRT-80

CRT TERMINAL BOARD!

A LOW COST Z-80 BASED SINGLE BOARD THAT ONLY NEEDS AN ASCII KEYBOARD, POWER SUPPLY, AND VIDEO MONITOR TO MAKE A COMPLETE CRT TERMINAL. USE AS A COMPUTER CONSOLE, OR WITH A MODEM FOR USE WITH ANY OF THE PHONE-LINE COMPUTER SERVICES.

FEATURES:
* Uses a Z80A and 6845 CRT Controller for powerful video capabilities.
* RS232 at 16 BAUD Rates from 75 to 19,200.
* 24 x 80 standard format (60 Hz).
* Optional formats from 24 x 80 (50 Hz) to 64 lines x 96 characters (60 Hz).
* Higher density formats require up to 3 additional 2K x 8 6116 RAMS.
* Uses N.S. INS 8250 BAUD Rate Gen. and USART combo IC.
* 3 Terminal Emulation Modes which are Dip Switch selectable. These include the LSI-ADM3A, the Heath H-19, and the Beehive.
* Composite or Split Video.
* Any polarity of video or sync.
* Inverse Video Capability.
* Small Size: 6.5 x 9 inches.
* Upper & lower case with descenders.
* 7 x 9 Character Matrix.
* Requires Par. ASCII keyboard.



$89.95 #ZRT-80

(COMPLETE KIT, 2K VIDEO RAM)

BLANK PCB WITH 2716 CHAR. ROM. 2732 MON. ROM $49.95

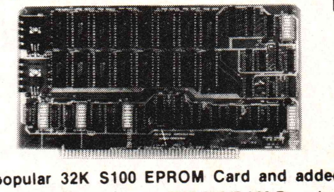
SOURCE DISKETTE - ADD $10

SET OF 2 CRYSTALS - ADD $7.50

FOR 8 IN. SOURCE DISK (CP/M COMPATIBLE) ADD $10

32K S100 EPROM/STATIC RAM

NEW! FOUR FUNCTION BOARD! NEW!



EPROM II FULL EPROM KIT $69.95

A&T EPROM ADD $35.00

BLANK PC BOARD WITH DATA $39.95

SUPPORT IC'S PLUS CAPS $16

FULL SOCKET SET $15

We took our very popular 32K S100 EPROM Card and added additional logic to create a more versatile EPROM/RAM Board.

PRICES SLASHED!

FEATURES:
* This one board can be used in any one of four ways:
  A. As a 32K 2716 EPROM Board
  B. As a 32K 2732 EPROM Board (Using Every Other Socket)
  C. As a mixed 32K 2716 EPROM/2K x 8 RAM Board
  D. As a 32K Static RAM Board
* Uses New 2K x 8 (TMM2016 or HM6116) RAM's
* Fully Supports IEEE 696 Buss Standard (As Proposed)
* Supports 24 Bit Extended Adressing
* 200 NS (FAST!) RAM'S are standard on the RAM Kit
* Supports both Cromemco and North Star Bank Select
* Supports Phantom
* On Board wait State Generator
* Every 2K Block may be disabled
* Addressed as two separate 16K Blocks on any 64K Boundary
* Perfect for MP/M* Systems
* RAM Kit is very low power (300 MA typical)

32K STATIC RAM KIT — $99.95

For RAM Kit A&T — Add $40

Digital Research Computers

P.O. BOX 381450 • DUNCANVILLE, TX 75138 • (214) 225-2309

TERMS: Add $3.00 postage. Orders under $15 add 75¢ handling. No C.O.D. We accept Visa and MasterCharge. Tex. Res. add 5-1/8% Tax. Foreign orders (except Canada) add 20% P & H. Orders over $50 add 85¢ for insurance.

*TM OF DIGITAL RESEARCH INC. (CALIF.)

WE ARE NOT ASSOCIATED WITH DIGITAL RESEARCH INC. (CALIF.) THE SUPPLIERS OF CPM SOFTWARE

Circle no. 87 on reader service card.

CP/M-68K Conditional Batch Processing

by Roger E. Donais

Anyone who uses batch processing is certain to recognize the value of conditional instructions. A few basic submit statements, such as SKIPIF, PAUSEIF, and ABORTIF have been added to CP/M-80 in the past. These instructions make it possible for compiling, assembling, and linking to be handled by a single submit file that is smart enough to stop the process if any phase should fail.

CP/M-68K and CP/M-80 are similar in many ways. In fact, files and programs can share the same disk without adverse consequences. They are, however, as different as the processors they support. Because CP/M-80 creates a working copy of a submit file, that file becomes the natural target for implementing batch control functions. On the other hand, CP/M-68K stores the expanded file in memory. The fact is that a direct approach would require more knowledge about the undocumented aspects of CP/M-68K than can be acquired in an evening!

A simple "if" can greatly speed the software development process.

IF.68K (Listing One, page 72) began as two outlines. The first listed what was wanted and the other described how it would be accomplished. One pencil later the following compromise was reached:

Syntax: The conditional statement is structured so as to minimize programming effort by taking advantage of the parsing done by the CCP, and yet present a recognizable form of conditional statement.

IF <parameter> <condition> .<action> /$$$$/ <statement>

Condition: The first four characters taken from the file-name field of the file control block created by the CCP are used to identify the condition to be tested. An asterisk may be appended to indicate that the complementary condition is to be used.

- AMBIG tests for an ambiguous parameter (wildcards).
- EXISTS tests for an existing file.
- EMPTY tests for an empty file or nonexistent file.
- NULL tests for an undefined parameter.

Actions: The first character taken from the file-type field of the same file control block is used to identify the desired action. An asterisk may again be appended to indicate that the complementary action is to be taken.

- S(kip) ignores the statement following /$$$$/.
- Q(uit) aborts submit file processing.
- P(ause) prompts for operator assistance.

The double-slash quad-dollar-sign token separates the conditional statement from the executable CP/M com-

Roger E. Donais, 7506 Republic Ct., Alexandria, VA 22306

mand tail. When the submit file is expanded, a dollar sign is used as the leading character to signal formal parameter replacement. If the next character is not an ASCII digit, the character is written to the expanded output and no replacement is performed. This simply means that we use four dollar signs in the submit file but have the program search for only two.

One disadvantage with this compromise approach is that CP/M-68K will pass only one command. This limits the range of the conditional statement to one CP/M-68K command. It's bad enough that the same conditional statement has to be entered over and over again in order to control a range of commands, but the aggravation of watching it reload each time is just too much!

With a little camouflage, CP/M can be tricked into passing more than one command. The best character seems to be a semicolon. Very few programs dare use this character because it marks the beginning of a comment. This makes it a prime candidate for an alternate command separator. It affects very few programs and conceals its true intent from CP/M, and our program need only replace these bogus separators with the exclamation marks that CP/M-68K expects to find.

The problem with this wonderful logic is that CP/M-68K seems to stop building the command tail after it finds a semicolon. Because the basic technique could use any character, a backslash became the next choice. Although the entire command tail is passed, the chain function does not protect the referenced line but leaves it where it is. It doesn't take much imagination to realize what happens when the default buffer is overwritten. So we are limited to using it with built-in commands and the aggravation of using only one external command.

Let's look at the resulting kludge. The program starts by looking for an action character in the second file control block. If it fails to find a match, as would be the case with a null parameter, it flips a switch before testing the first file control block. Control is then transferred according to the indicated action.

Each action begins by making a call to evaluate the condition. This evaluation ends with a jump that complements the original condition according to a NOT condition and a NOT action request. This is definitely a kludge that capitalizes upon the parsing and setup done by the CCP. The file-name and file-type fields are normally padded with spaces (an even $20). The presence of an asterisk (CP/M wildcard) changes the padding character to a question mark (an odd $3F). The code uses this even/odd fill character to blindly obtain the desired state.

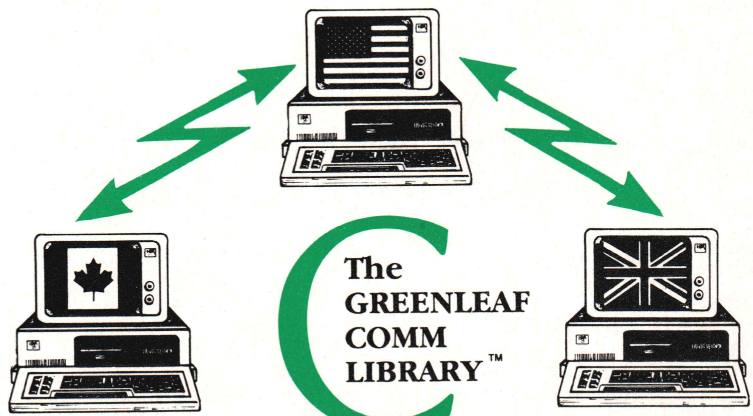
The two complementary labels, TRUE and FALSE, are truly illusionary. What began as a simple matter

ARE YOU TRYING TO COMMUNICATE ?

C programs can communicate with the world now through the power of **The Greenleaf Comm Library.** Now from the people who brought you **The Greenleaf Functions** General Library for C, comes this rich interrupt driven, ring-buffered asynchronous communications capability.

Over 100 functions in C and assembler to facilitate communications at up to 9600 baud. Up to eight ports at a time. ASCII or XMODEM. X-On/X-Off too. Hayes compatible modems controlled here. Safe too, bet you can't exit your application with interrupts hot. Major applications around the world base their communicating applications on **The Greenleaf Comm Library.** Stop just trying and start really communicating. Get your copy of **The Greenleaf Comm Library** today. For all major C compilers, all models, all versions. For the IBM PC and just about any machine with MSDOS and an 8086. Comes with source code, extensive examples, demo programs, featuring **C-Terminal,** reference card and newsletter. No royalty. $185

Other Products: The Greenleaf Functions General Library, over 220 functions for total control of the IBM PC, with source. $185 for the compilers listed below. (See ordering instructions below).



Specify compiler when ordering: Lattice, Microsoft, Computer Innovations, Mark Williams, or DeSmet. Add $7.00 for UPS Second Day Air (or $5.00 for ground). Texas residents add sales tax. Mastercard, VISA, check, or P.O. In stock, shipped same day.

☐General Libraries $185
☐Comm Library $185
☐CI186 Compiler $349
☐Lattice C $395
☐Mark Williams $475

PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE.

For Information: 214/446-8641

GREENLEAF SOFTWARE©
2101 HICKORY DR.
CARROLLTON, TX 75006

Circle **no. 97** on reader service card.

of going to one or the other, based upon the resulting condition, turned into quite a nightmare. At times it seemed that neither one was right. Had they been ZIP and ZAP they might not have confused the issue so much. Debugging eventually reached a point where I would no longer look at them or at the remarks. It became, "Well, it's BEQ now, so let's try BNE" or "target is TRUE, so try FALSE!" It became worse regardless of what I tried. Finally, everything was wrong. That made it easy. TRUE became FALSE and FALSE became TRUE. I no longer care how it looks nor if it makes sense. It works and that is the end of it!

A skip is performed by merely ending the program and returning to the CCP. The command is executed by invoking the CP/M-68K chain function after replacing all semicolons with exclamation marks.

There may be a more direct way to abort than the method used. Programs, however, evolve according to a programmer's knowledge and imagination. My 68000 and CP/M-68K knowledge is very limited, so that left only imagination. The *CP/M User's Guide* says that a submit statement contained in a submit file would transfer control if the referenced file exists. Otherwise the statement would be ignored and processing would resume with the next statement in the current file.

The solution is obvious: invoke an existing, empty submit file—*et voilà*! The actual code goes one step more. It creates a submit file with a single instruction that subsequently erases itself. The result may not be fast, but it does abort without having to keep more junk on the disk.

Yes, the whole thing has the potential to be fooled and foiled. But if you remain within the guidelines and don't wander beyond its incomplete parsing and blind processing, it performs exactly as intended. The crazy little submit file in Listing Two (page 82) may well be the world's slowest ERAQ, but it does provide an example to demonstrate the performance of IF.68K. The additional example in Listing Three (page 82) not only conditionally assembles and links the modules of an assembly project but also copies the changed source files from a RAM disk to floppy. Naturally, execution speed is improved by loading IF.68K from a RAM disk rather than floppy.

DDJ

Reader Ballot
Vote for your favorite feature/article.
Circle Reader Service **No. 195**.

CP/M-68K (Text begins on page 70)

Listing One

```
*****************************************************************
*                                                               *
* PROGRAM:  IF.68K                    LAST UPDATE:  10 Mar 85   *
*                                                               *
* PURPOSE:  PROVIDE BASIC CONTROL FOR CP/M-68k SUBMIT FACILITY *
*                                                               *
* AUTHOR:   Roger E. Donais           TEL: (703) 765-0615       *
*           7506 Republic Ct.                                   *
*           Alexandria, VA 22306                                *
*                                                               *
* UPDATE LOG:                                                   *
*                                                               *
* 1.2    10 Mar 85 --- Replaced non-working semi-colon with     *
*                         back-slash as command separator and   *
*                         added ^Z check for empty file  ...red *
* 1.1    14 Nov 84 --- Added semi-colon as muliple command      *
*                         separator                      ...red *
* 1.0    11 Jul 84                                              *
*                                                               *
*****************************************************************
*                                                               *
* SYNTAX:                                                       *
*                                                               *
*       IF <Filename> <Condition>.<Action> /$$$$/ <statement>   *
*                                                               *
*       CONDITION IS: AMBIG - TO TEST FOR AMBIGIOUS FILESPEC    *
*                     EXIST - TO TEST FOR AN EXISTING FILE      *
*                     EMPTY - TO TEST FOR AN EMPTY FILE         *
*                     NULL  - TO TEST FOR A NULL PARAMETER      *
*                                                               *
*       ACTION IS:    S - TO SKIP STATMENT PART OF COMMAND LINE *
*                     Q - TO QUIT SUBMIT FILE PROCESS           *
*                     P - TO PAUSE FOR OPERATOR ASSISTANCE      *
*                                                               *
*       STATEMENT IS ANY VALID CP/M COMMAND                     *
*                                                               *
*       NOTE:   AN ASTERISK (*) MAY BE APPENDED TO THE CONDITION *
*               AND/OR THE ACTION TO INDICATE NEGATION.  AMBIG* *
*               WOULD THUS TRANSLATE "NOT AMBIGIOUS" AND Q* WOULD *
*               TRANSLATE "DO NOT QUIT".                        *
```

(Continued on page 74)

A FULL C COMPILER FOR $49^{95}

Limited time offer:

FREE CED TEXT EDITOR WITH EACH ECO-C88

Ecosoft's Eco-C88 C Compiler

An unbeatable value! For $49.95 you get:

- A C compiler with all data types and operators (except bit fields)
- Fast executing code. Some common benchmark results are:

	Eco-C88	L (1)	C86 (1)	MS (1)	MW (1)
sieve	12	11	13	11	12
fib	43	58	46	109	—
deref	14	13	—	10	11
matrix	22	29	27	28	29

1. Computer Language, Feb., 1985. Reproduced with permission.

- 8087 support using a single library. The 8087 is sensed at runtime and used if present.
- A standard library with over 200 functions (many of which are System V compatible for greater portability).
- Error messages in English - no cryptic numbers to look up.
- A cc and "mini-make" (in source) that makes compiling a snap.
- ASM or OBJ output (for use with MSDOS linker).
- Expanded user's manual.
- Works with all IBM PC's and clones using MSDOS 2.1 or later.

ORDERS ONLY
1-800-952-0472

The ECOSOFT family of C products
ORDER FORM

☐ C Compiler $49.95 ______
☐ Programming Guide $20.00 ______
☐ Self-Study Guide $17.00 ______
☐ Programmer's Library $20.00 ______
☐ Program Editor $29.95 ______
☐ C Library Source $10.00 ______
☐ ISAM (.OBJ) $15.00 ______
Total* (Ind. res. add 5% tax) ______
*Please add $4.00 for shipping.
Payment: VISA MC AE Check
Credit card expir. date ______
Card # ______
Name ______
Address ______
City, state ______
Zip ______ Phone ______

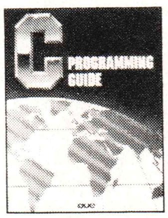
Ecosoft, Inc.
6413 N. College Ave.
Indianapolis, IN 46220
(317) 255-6476 · 8:30-4:30

ECOSOFT INC.

Other Eco-C Products

CED Program Editor. $29.95

A screen-oriented program text editor similar to the Turbo Pascal editor. You can create, compile and link the source file with CED. If there is an error, CED automatically reloads the source file and places the cursor on the offending section of code. CED supports editing multiple files (with windows), macros, more than 50 editing commands and is configurable to your particular needs and preferences. An outstanding value.

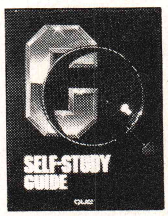


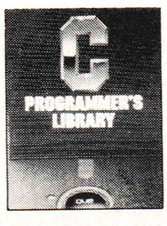
C Programming Guide, 2nd Ed. (Purdum, Que Corp.) $19.95

This best seller walks you through the C language in an easy-to-read manner. All aspects of the language are covered, including many of the new ANSI Standards suggestions. Many of the error messages issued by the Eco-C88 compiler reference page numbers in this text making an ideal learning environment.

C Self-Study Guide (Purdum, Que Corp.) $16.95

This new book is designed for the person that is learning C on their own. The book is filled with questions and answers that most beginning C programmers have. It also includes many sample programs that illustrate tips, traps and techniques that may take years to discover otherwise. A perfect compliment to the Guide book.





C Programmer's Library (Purdum, Leslie, Stegemoller, Que Corp.) $19.95

This best seller is an intermediate level text designed to show you how to write functions for your C library. The book contains many useful library additions, including an ISAM file handler, plus sections on advanced C topics.

TRADEMARKS: ECO-C88, ECOSOFT; TURBO PASCAL, BORLAND INT'L.

Circle no. 89 on reader service card.

Listing One

```
*                                                            *
*       MULTIPLE COMMANDS MAY BE SEPARATED BY SEMI-COLONS, AN *
*       EXCLAIMATION MARK (!) OR END OF LINE ENDS STATEMENT.  *
*                                                            *
**************************************************************

* CP/M FUNCTION DEFINITIONS
bdos            equ  2
fnABORT         equ  Ø
fnCINP          equ  1
fnCOUT          equ  2
fnPRINT         equ  9
fnRESET         equ 13
fnOPEN          equ 15
fnCLOSE         equ 16
fnDELETE        equ 19
fnREAD          equ 20
fnWRITE         equ 21
fnCREATE        equ 22
fnDMA           equ 26
fnCHAIN         equ 47

.page
* MISC CONSTANTS
FCB1            equ $5C         1st CP/M File Control Block
FCB2            equ $38         2nd CP/M File Control Block
NAM1            equ FCB1+1      1st FCB File Name field
NAM2            equ FCB2+1      2nd FCB File Name field
TYP1            equ NAM1+8      1st FCB File Type field
TYP2            equ NAM2+8      2nd FCB File Type field
BUFF            equ $8Ø         Default CP/M Buffer / Command Line
SIZE            equ $ØF+FCB1    CP/M File Size (Sector Count) FOR FCB1

*************************************************************
* PHASE-1 --- PROCESS (P)AUSE), (S)KIP  and (Q)UIT PARAMETERS

        MOVE.L  4(A7),A6        A6 Contains Base Page
        LEA     128(A6),A3      DEFAULT BUFFER
        MOVE.B  TYP2(A6),DØ     Get Action Character - 2nd FCB
RETRY:
        CMP.B   #'S',DØ
        BEQ     SKIP
        CMP.B   #'Q',DØ
        BEQ     QUIT
        CMP.B   #'P',DØ
        BEQ     PAUSE
        MOVE.B  TYP1(A6),DØ     Get Action Character - 1st FCB
        EOR #1,NULLFLG
        BNE     RETRY
ERROR:
        MOVE.L #MESSAGE,A1
ERROR1:
        MOVE.B (A1)+,D1
        BEQ  ERROR2
        EXT  D1
        MOVE #fnCOUT,DØ
        TRAP #bdos
        BRA  ERROR1
ERROR2:
        MOVE #fnABORT,DØ
        TRAP #bdos

NULLFLG:
        DC.W ØØØØ

.page
*************************************************************
* PHASE-2 --- PROCESS AMBIG, EXISTS, EMPTY and NULL PARAMETERS
COMPARE:
        MOVE #4-1,dØ            4 Character token count
        LEA  NAM2(A6),AØ        Get Token address
        TST NULLFLG
```

```
        BEQ L1
        LEA NAM1(A6),AØ
L1:     LSL.L #8,D2                 Make room for next character
        MOVE.B (AØ)+,D2               and load it
        DBRA DØ,L1                  Repeat for all 4-characters

        MOVE.L #TABLE,AØ            Point to Function Table
        MOVE   #4-1,DØ              Number of Entries
L2:     MOVE.L (AØ)+,D1             Get Current Entry
        CMP.L   D2,D1
        BEQ  JUMP                   Exit on Match
        ADDA #4,AØ                  Else Step to Next Entry
        DBRA DØ,L2                    and Repeat for ALL Entries
L3:     ADDA #4,A7                  Pop callers from stack
        BRA  ERROR                    and abort
JUMP:
        TST NULLFLG
        BEQ JMP1                    EVERYTHING GOOD ON 2ND FCB
        TST DØ
        BNE L3                      AND ONLY NULL ON 1ST FCB
JMP1:   MOVE.L (AØ),AØ              JUMP TO FUNCTION
        JMP (AØ)
.page
**************************************************************
SKIP:   * SKIP COMMAND TAIL IF CONDITION TRUE
        BSR COMPARE
        BNE CHAIN                   Execute Command Tail if FALSE
EXIT:   RTS                         and Ignore if TRUE

**************************************************************
QUIT:   * QUIT (ABORT) SUBMIT IF CONDITION TRUE
        BSR COMPARE
        BNE CHAIN                   Ignore Command Tail if FALSE
ABORT:
        MOVE.L  #ABORTMSG,D1
        MOVE    #fnPRINT,DØ
        TRAP    #bdos
```

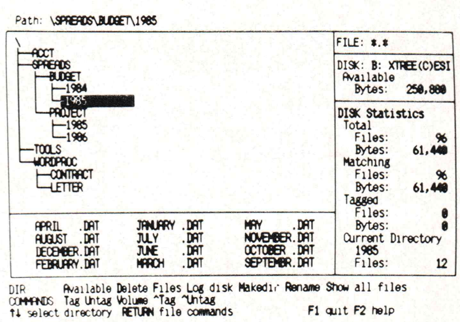
(Continued on next page)

"XTREE™ has redefined my relationship with my hard drive."

—PC MAGAZINE

Why XTREE is the New Standard For File and Directory Management.

XTREE simplifies file and directory handling by providing single keystroke commands to access, delete, rename, view, move, list or show all files within any and all directories. XTREE displays a graphic picture of your directory organization, instantly shows all the files in each directory or all files across all directories! Just point with the arrow keys (full scrolling and paging in all windows) and press a key. Your menu is clearly displayed at all times.



10 Reasons To Buy XTREE

1. Shows **ALL** files or groups of files in **ALL** directories in one sorted display.
2. Copy, delete or rename multiple files in different directories in **ONE** operation.
3. Automatically copies groups of files across several diskettes.
4. **NOT** copy-protected.
5. Demo available for only $5.00 includes reusable diskette case (holds up to 5 disks).
6. "I finally found a package that I use routinely to clean up my disks. I recommend it highly. It's a steal at $49.95."
   — John Dvorak, Infoworld
7. "All XTREE operations execute very quickly. XTREE is a great utility for getting an overall feel of your hard disk. And, if you feel the need to totally reorganize your hard disk, XTREE is unparalleled."
   — Garry Ray, PC Week
8. "If the program were not already subtitled *The new standard for file and directory management*, I would have described this wonderful new utility the exact same way."
   — Phil Wiswell, PC Magazine
9. Only **$49.95** plus $2 shipping.
10. **To Order call 800-634-5545 In CA (818) 990-3457 or send check or money order to:**
    EXECUTIVE SYSTEMS, INC.
    15300 Ventura Blvd., Suite 305, Sherman Oaks, CA 91403

Circle **no. 180** on reader service card.

Listing One

```
        MOVE    #fnRESET,D0
        TRAP    #bdos           Make Certain Drive A: is R/W
        MOVE.L  #ABORTREC,D1
        MOVE    #fnDMA,D0       Setup for File Output
        TRAP    #bdos
        MOVE.L  #ABORTFCB,D1
        MOVE    #fnDELETE,D0    Delete any '$$$ABORT.SUB' File
        TRAP    #bdos
        MOVE    #fnCREATE,D0    Then make a new one
        TRAP    #bdos
        MOVE    #fnWRITE,D0     Fill it
        TRAP    #bdos
        MOVE    #fnCLOSE,D0     Close it
        TRAP    #bdos
        MOVE.L  #ABORTSUB,D1    and Chain to it
        BRA     CHAIN1

***************************************************************
PAUSE:  * PAUSE IF CONDITION TRUE
        BSR COMPARE
        BNE CHAIN               EXECUTE W/O STOPPING IF FALSE
   X9:
        MOVE.L #PROMPT,D1
        MOVE #fnPRINT,D0
        TRAP #bdos
        MOVE #fnCINP,D0
```

(Continued on page 78)

68020 Cross Assembler

Features:

- Instruction Set Fully Compatible with Motorola (Including 68000/08/10 and 68020 Instructions)
- User Defined Symbols Unique to 31 Characters
- 32 Bit Addressing Supporting All Motorola Addressing Modes
- Powerful Macro Facility
- Structured Directives
- Symbol Cross Reference Listings
- Conditional Assembly Directives
- Linking Loader
- Motorola Standard Hexadecimal S-Record Format Object Module Output
- Librarian
- Conversion and Download Utilities Supporting Tektronix and Hewlett-Packard

Now available: 68020 Symbolic Debugger
In 4th quarter '85: 68020 C Cross Compiler

3930 Freedom Circle, Suite 101, Santa Clara, CA 95054
Mailing Address: P.O. Box 60337, Sunnyvale, CA 94088

MICROTEC® RESEARCH

The Microtec ASM68K Cross Assembler System is a Microtec Research implementation of the assembly language specified by Motorola Corporation for its 68000/68010/68020 microprocessor family. ASM68K is used to assemble and link/load programs on a general purpose host computer, then download those programs for execution on the above microprocessor. The Microtec ASM68K package includes macro assembler, linking loader, Tektronix conversion utility, and download utility. An optional object module librarian is also available which enhances the effectiveness of the linking loader.

Quality, Compatibility and **Service** are the differences which set Microtec Research apart from others.

If you're a serious software developer, shopping for software development tools, call or write today for more information:
800- 551-5554.
In CA call **(408) 733-2919.**

DE SMET C

8086/8088 Development Package

$109

FULL DEVELOPMENT PACKAGE

- Full K&R C Compiler
- Assembler, Linker & Librarian
- Full Screen Editor
- Execution Profiler
- Complete STDIO Library (>120 Func)

Automatic DOS 1.X/2.X SUPPORT

BOTH 8087 & S/W FLOATING POINT

OVERLAYS

OUTSTANDING PERFORMANCE

- First and Second in AUG '83 BYTE benchmarks

SYMBOLIC DEBUGGER $50

- Examine & change variables by name using C expressions
- Flip between debug and display screen
- Display C source during execution
- Set multiple breakpoints by function or line number

DOS LINK SUPPORT $35

- Converts DeSmet.O to DOS.OBJ Format
- LINKs with DOS ASM
- Uses Lattice® naming conventions

C WARE CORPORATION

P.O. Box C, Sunnyvale, CA 94087
(408) 720-9696

Street Address: 505 W. Olive, #767 (94086) Call for hrs.

All orders shipped UPS surface on IBM format disks. Shipping included in price. California residents add sales tax. Canada shipping add $5, elsewhere add $15. Checks must be on U.S. Bank and in U.S. Dollars. Call 9am–1pm to CHARGE by VISA/MC/AMEX.

Foreign Distributors: **AFRICA,** HI-TECH SVCS, Gaborone 4540 or Telex 2205BD LANGER • **ENGLAND**: MLH Tech, 0606-891146 • **JAPAN**: JSE 03-486-7151 • **SWEDEN**: ESCORT DATA 08-87 41 48 **or** THESEUS KONSULT 08-23 61 60

edward k. ream

Transform Your Programs with CPP—C Preprocessor Plus

Includes ALL features of the standard C preprocessor.

- Define arbitrarily complex macros with #define command.
- Include and nest files to any depth with #include command.
- Conditionally include or exclude lines with #if, #ifdef and #ifndef commands.
- Optional extra feature: Imbed formatting or other commands in your source code. (Lines starting with . or * are ignored.)

Fast and flexible

- 30 times faster than the Preprocessor published in Dr. Dobb's Journal.
- Can be used for any language, including assembler.
- Can be used as a stand-alone macro/include processor.
- Code can be used as the lexical analyzer for parsers or assemblers.

Complete

- You get complete SOURCE CODE in standard C.
- You get everything you need to use CPP immediately.
- CPP is unconditionally guaranteed. If for any reason you are not satisfied with CPP, your money will be refunded promptly.

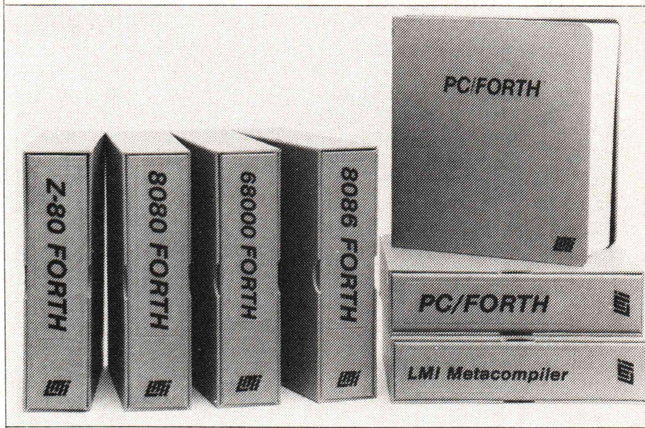
Price: $50.

Call or write today:
Edward K. Ream
1850 Summit Ave., Dept. DD
Madison, WI 53705
(608) 231-2952

TO ORDER: Specify both the operating system (MS-DOS, CP/M 80 or CPM 68K) and the disk format (8 inch CP/M or the exact type of 5¼ inch disk). Send a check or money order for $50 ($60 for foreign orders). Foreign checks must be denominated in U.S. dollars drawn on a U.S. bank. Sorry, I do NOT accept phone, credit card or COD orders. Please do NOT send purchase orders unless a check in included.

Circle no. 90 on reader service card.

TOTAL CONTROL with *LMI FORTH*™



For Programming Professionals:

an expanding family of compatible, high-performance, Forth-83 Standard compilers for microcomputers

For Development:
Interactive Forth-83 Interpreter/Compilers

- 16-bit and 32-bit implementations
- Full screen editor and assembler
- Uses standard operating system files
- 400 page manual written in plain English
- Options include software floating point, arithmetic coprocessor support, symbolic debugger, native code compilers, and graphics support

For Applications: Forth-83 Metacompiler

- Unique table-driven multi-pass Forth compiler
- Compiles compact ROMable or disk-based applications
- Excellent error handling
- Produces headerless code, compiles from intermediate states, and performs conditional compilation
- Cross-compiles to 8080, Z-80, 8086, 68000, and 6502
- No license fee or royalty for compiled applications

Support Services for registered users:

- Technical Assistance Hotline
- Periodic newsletters and low-cost updates
- Bulletin Board System

Call or write for detailed product information and prices. Consulting and Educational Services available by special arrangement.

Laboratory Microsystems Incorporated
Post Office Box 10430, Marina del Rey, CA 90295
Phone credit card orders to: ***(213) 306-7412***

Overseas Distributors.
Germany: Forth-Systeme Angelika Flesch, D-7820 Titisee-Neustadt
UK: System Science Ltd., London EC1A 9JX
France: Micro-Sigma S.A.R.L., 75008 Paris
Japan: Southern Pacific Ltd., Yokohama 220
Australia: Wave-onic Associates, 6107 Wilson, W.A.

Circle no. 66 on reader service card.

Listing One

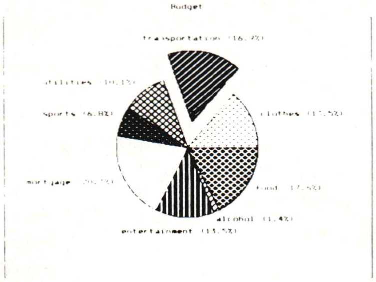
```
        TRAP #bdos
        AND   #$5F,DØ           Force upper case
        CMP.B    #'Q',DØ
        BEQ      ABORT          Quit on "Q"
        CMP.B    #'S',DØ
        BEQ      EXIT           Skip on "S"
        CMP.B    #'C',DØ
        BNE      X9             And continue on "C"
.page
CHAIN:  * CHAIN TO COMMAND TAIL

        ADD      #BUFF,A6       Point to command line
        MOVE.B   (A6)+,DØ       Get command length
        EXT      DØ

X5:     DBRA DØ,X6              Ignore Statement if Command
        RTS                       Tail cannot be found

X6:     CMP.B #'/',(A6)+
        BNE X5                  Look for leading slash

        CMP.B #' ',-2(A6)       Insure that the previous
        BEQ X7                    character was either
        CMP.B #9,-2(A6)           a space or tab
        BNE X5
X7:
        CMP.B #'$',(A6)+        The Original four dollar
        BNE X5                    signs will appear
        CMP.B #'$',(A6)+          as only two, so
        BNE X5                    check for 2 $'s


        CMP.B #'/',(A6)+        Check for trailing slash
        BNE X5

        CMP.B #' ',(A6)+        And finally delimiting
        BEQ X8                    space or tab
        CMP.B #9,-1(A6)
        BNE X5
X8:
* So we got the command tail. Let's take a quick break
* and repalce all semicolons with exclaimation marks.
        move.l A6,A1            copy pointer and
        move   DØ,D1            character count,
        bra Y1Ø                 then begin search
Y9:
          move.b #'!',-1(A1)
Y1Ø:
            cmp.b #'\',(A1)+
          dbeq D1,Y1Ø           search until eol or '\'
        beq Y9                  substitute & continue if '\'

        SUB #1,A6               Step back to new len position
        ADD #1,DØ                 adjust remaining command length
        MOVE.B DØ,(A6)            and punch it
        MOVE.L A6,D1            Put the command tail in D1
CHAIN1:
        MOVE #fnDMA,DØ          Make addr in D1
        TRAP #bdos              the Default Buffer
        MOVE #fnCHAIN,DØ
        TRAP #bdos              and Chain it

****************************************************************
OPEN:
        MOVE.L   A6,D1          Base page to D1
        ADD.L    #FCB1,D1         and step to fcb
        MOVE     #fnOPEN,DØ
        TRAP #bdos
        CMP.B    #$FF,DØ        Set flags on open file
        RTS
.page
NULL1:  CMP.B #$2Ø,NAM1(A6)     Test for no file name
        BNE TRUE
```

(Continued on page 80)

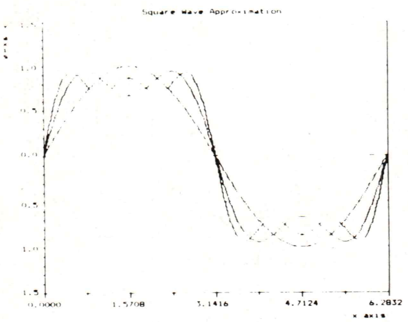
GRAF 3.0

the complete
BUSINESS and SCIENTIFIC
printer graphics program

$49.95 CP/M-80 | $69.95 MS-DOS / PC-DOS



- display floating point data directly from spreadsheets, data bases, word processors, and programming languages (or the keyboard) in a wide variety of bar, pie, line, and scatter plots
- plot and group up to 6 different variables on a single graph, distinguished by up to 14 different fill-in patterns and 8 different point-plotting symbols
- menu driven operation supports automatic graph scaling, labeling, and legend creation
- add up to 5 different-density grid lines, and choose from a wide variety of numerical labeling options



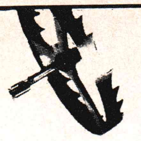
GRAF 2.0 Update Policy: Returning your original GRAF 2.0 disk to MSC entitles you to $20.00 off the above prices.
Numeric Compressor Option: 8087 support for the MS-DOS/PC-DOS version of GRAF 3.0 is available for an additional $20.00.

TERMS: We ship via first class mail. The above prices include domestic shipping and handling. Orders outside USA require additional $5.00 for postage. N.Y. residents add state sales tax. When ordering you MUST state your computer and printer make and model. We support MS-DOS (PC-DOS) version 2.0 or later on computers with at least 192k RAM, and CP/M-80 version 2.2 or later on Z80 computers (other than modified Apples) supporting a TPA of at least 54k (requires 64k of RAM). Most soft-sector disk formats are available. (If you can read several formats, please send us a list.) GRAF 3.0 works with any printer fully compatible with one of the following: Epson FX, RX, LX, MX (with GRAFTRAX), or LQ-1500; C. Itoh Prowriter; NEC 8023A; Star Micronics Gemini 10X, 15X, SG-10, SG-15; IBM Graphics Printer; Okidata 192, and earlier Okidata models equipped with the "IBM Plug 'n' Play" chips. (If you have an Okidata printer, other than the 192, the Plug 'n' Play chips are *required!*)

MSC Microcomputer Systems Consultants

27 Forest Avenue
Port Jefferson Station
New York 11776-1820

Circle **no. 136** on reader service card.



BD Software, Inc., maker of the original CP/M-80 C Language Development System, knows

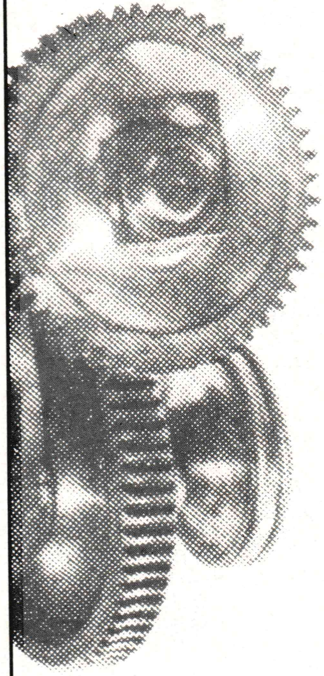
Time is precious

So the compilation, linkage and execution speeds of BDS C are the fastest available, even (especially!) on floppy-based systems. Just ask any user! With 15,000+ packages sold since 1979, there are *lots* of users . . .

New! Ed Ream's RED text editor has been integrated into the package, making BDS C a truly complete, self-contained C development system.

Powerful original features: CDB symbolic source-level debugger, fully customizable library and run-time package (for convenient ROM-ing of code), XMODEM-compatible telecommunications package, and other sample applications.

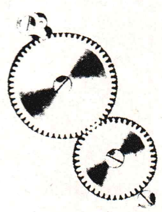
National C User's Group provides direct access to the wealth of public-domain software written in BDS C, including text editors and formatters, BBS's, assemblers, C compliers, games and much more.



Complete package price: $150.
All soft-sectored disk formats, plus Apple CP/M, available off-the-shelf. Shipping: free, by UPS, within USA for *prepaid* orders. Canada: $5. Other: $25. VISA, MC, COD, rush orders accepted.

BDSoftware, Inc.

BD Software, Inc.
P O Box 2368
Cambridge MA 02238
617 • 576 • 3828



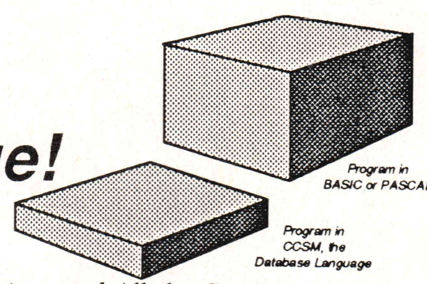
Circle **no. 123** on reader service card.

 (Listing continued, text begins on page 70)

Listing One

```
FALSE:   MOVE #Ø,DØ                 Start with FALSE
         BRA TOGGLE

TRUE:    MOVE #1,DØ                 Start with TRUE
TOGGLE:  EOR.B DØ,TYP2-1(A6)        TOGGLE "NOT CONDITION"
         MOVE.B TYP2-1(A6),DØ
         EOR.B DØ,TYP2+2(A6)        TOGGLE "NOT ACTION"
         BTST #Ø,TYP2+2(A6)         FLAG RESULT
         RTS

***************************************************************
NULL:    * TEST FIRST FCB FOR NULL PARAMETER

         TST NULLFLG                If FCB2 is in use the
         BEQ NULL1                  Condition is FCB1 Filename
         EOR.B  DØ,TYP1-1(A6)       else TOGGLE
         MOVE.B TYP1-1(A6),DØ       using FCB1 Pad Characters
         EOR.B  DØ,TYP1+2(A6)
         BTST #Ø,TYP1+2(A6)
         RTS

***************************************************************

EMPTY:   * TEST FIRST FCB FOR NULL, NON-EXISTANT OR EMPTY FILE

         CMP.B #2Ø,NAM1(A6)         NO FILE NAME IS EMPTY FILE
         BEQ FALSE
         BSR OPEN                   NON-EXISTANT IS ALSO EMPTY
         BEQ FALSE
         MOVEQ #fnREAD,DØ
         TRAP  #2
         TST   DØ
```


Write 1/3 the code with CCSM, the Database Language! Only $59.95!



Now, you can dramatically increase your programming productivity, with CCSM, the Database Language.
If you're writing programs in BASIC or PASCAL, you'll appreciate our full-screen editor. You'll also write about 1/3 the amount of code, with this compact, productive language.

Raw Power for Raw Data

CCSM, the Database Language, developed by COMP Computing, is a proprietary version of ANSI Standard MUMPS. MUMPS as a language has been refined and developed for the past 20 years, and is used in corporate America, and by countless thousands around the world, who must manage large and complicated filing systems.

With CCSM, the Database Language, you won't be restricted with line numbers, and different "dialects", as you are with BASIC. CCSM,the Database Language, will transport directly from your microcomputer, to a mini or mainframe WITHOUT MODIFICATION!

CCSM, the Database Language, is also "type-less". That means you can use variables "on the fly", without the tyranny of type declarations such as found in PASCAL.

IBM and Macintosh are trademarks of International Business Machines, and Apple.

B-Tree Record Structure, and All the Goodies

CCSM, the Database Language, doesn't make you decide when to use "sequential" files, or "random" files...all records are stored in a B-Tree file for rapid access, and maximum flexibility. In terms of technical excellence, CCSM, the Database Language, utilizes virtual memory, so programs or local variables can expand to the size of the disk. CCSM's sophisticated buffer-pooling provides faster performance than RAM-disk alternatives...8087 and BCD support, included!

Stop Kludging, Start Computing!

Programming and database solutions are as close as your phone. Call Guidance Software now, and get CCSM, the Database Language, for your 128K IBM, or IBM-compatible. (Macintosh version, coming) *CCSM, the Database Language, sells for $59.95, and includes full documentation. For another $9.95, we'll send a "cookbook" of programs, and a second disk of popular subroutines and utilities. If you need bar charts and pie graphs, also order the graphics disk for $49.95. A multi-user version (up to 15) is available for $450. MasterCard, VISA, and AMEX accepted by phone.*

1-800-257-8052

In Texas, 713-529-2576

Guidance Software, PO Box 5362, Kingwood, TX 77325

Circle **no. 98** on reader service card.

```
        BNE FALSE                NO RECORD == EMPTY FILE
        CMP.B #$1A,(A3)
        BEQ FALSE                ^Z MUST BE EMPTY ASCII FILE
        BRA TRUE

***************************************************************************
EXIST:  * TEST FIRST FCB FOR EXISTING FILE

        BSR OPEN
        BNE FALSE                File not Found Therefore Non-Existant
        BRA TRUE                 otherwise it's naturally there

***************************************************************************
AMBIG:  * TEST FIRST FCB FOR AMBIGIOUS NAME OR TYPE

        MOVE #11-1,D0            Test 8-Char NAME + 3-Char TYPE
      X4:
            CMP.B #'?',NAM1(A6,D0)
        DBEQ D0,X4
        BNE TRUE                 Contains "?" Therefore Ambigious
        BRA FALSE
.page
***************************************************************************
******************** DATA STORAGE AREA ************************
TABLE   DC.B 'AMBI'
        DC.L AMBIG             ***********************************
        DC.B 'EMPT'            *               NOTE              *
        DC.L EMPTY             *                                 *
        DC.B 'EXIS'            * NULL MUST BE THE LAST TABLE     *
        DC.L EXIST             * ENTRY. SEE COMPARE SUBROUTINE   *
        DC.B 'NULL'            *                                 *
        DC.L NULL              ***********************************

ABORTSUB:
        DC.B 10,'A:$$$ABORT',0
ABORTREC:
        DC.B 'ERA A:$$$$$$ABORT.SUB',$D,$A
```

(Continued on next page)

Time and Money.

We've just done something we know you'll like. We've made the SemiDisk far more affordable than ever before. With price cuts over 25% for most of our product line. Even our new 2 megabyte units are included.

It's Expandable

SemiDisk Systems builds fast disk emulators for more microcomputers than anyone else. S-100, IBM-PC, Epson QX-10, TRS-80 Models II, 12, and 16. You can start with as little as 512K bytes, and later upgrade to 2 megabytes per board...at your own pace, as your needs expand. Up to 8 megabytes per computer, using only four bus slots, max! Software drivers are available for CP/M 80, MS-DOS, ZDOS, TurboDOS, VALDOCS 2, and Cromix. SemiDisk turns good computers into **great** computers.

Battery Backup, Too

At 0.7 amps per 2 megabytes, SemiDisk consumes far less power than the competition. And you don't have to worry if the lights go out. The battery backup option gives you 5-10 hours of data protection during a blackout. Nobody else has this important feature. Why risk valuable data?

The Best News

	512K	1Mbyte	2Mbyte
SemiDisk I, S-100	$695	$1395	
SemiDisk II, S-100	$995		$1995
IBM PC, XT, AT	$595		$1795
QX-10	$595		$1795
TRS-80 II, 12, 16	$695		$1795
Battery Backup Unit	$150	$150	$150

Someday you'll get a SemiDisk.
Until then, you'll just have to....wait.

SEMIDISK

SemiDisk Systems, Inc., P.O. Box GG, Beaverton, Oregon 97075   503-642-3100

MasterCard VISA

Call 503-646-5510 for CBBS/NW, 503-775-4838 for CBBS/PCS, and 503-649-8327 for CBBS/Aloha, all SemiDisk equipped computer bulletin boards (300/1200 baud) SemiDisk, SemiSpool trademarks of SemiDisk Systems.

Circle **no. 85** on reader service card.

Listing One

```
        DC.L ';SUBMIT FILE PROCESSING ABORTED',$D,$A,$1A
ABORTFCB:
        DC.B 1,'$$$ABORTSUB'
        DC.B 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
ABORTMSG
        DC.B $D,$A,'ABORTING ...$'

PROMPT:
  DC.B $7,$D,$A,$D,$A,'SUBMIT FILE PROCESSING PAUSED.',$D,$A,$D,$A

  DC.B $7,'    PRESS: (Q) TO QUIT, (S) TO SKIP  -or-  (C) TO CONTINUE $'

MESSAGE:
  DC.B 7,$D,$A,$A
  DC.B 'IF.68K Ver 1.2 CONDITIONAL SUBMIT COMMAND FORMAT:',$D,$A,$A
  DC.B '  IF <filespec>  AMBIGx.yx /$$$$/ <command tail>',$D,$A
  DC.B '  IF <filespec>  EXISTx.yx /$$$$/ <command tail>',$D,$A
  DC.B '  IF <filespec>  EMPTYx.yx /$$$$/ <command tail>',$D,$A
  DC.B '  IF <parameter>  NULLx.yx /$$$$/ <command tail>',$D,$A,$A

  DC.B '  WHERE: x is an optional "*" to indicate negation',$D,$A
  DC.B '     and y is (Q)uit, (S)kip or (P)ause',$D,$A,$A

  DC.B '  NOTE:  Command tail may consist of multiple commands',$D,$A
  DC.B '         separated by backslashes (\) and ends at an',$D,$A
  DC.B '         exclamation mark (!) or physical end of line.',$D,$A,$A

  DC.B '  EXAMPLE:  IF A:JUNK.TYP  /$$$$/ EMPTY.S CMD1\CMD2!CMD3',$D,$A,$A
  DC.B '    Neither CMD1 nor CMD2 will execute if A:JUNK.TYP',$D,$A
  DC.B '    is empty.  Regardless, CMD3 will always execute.'

  DC.B $D,$A,$A,0

        END
```

End Listing One

Listing Two

```
              ERAQ.SUB  -  File Deletion with Query

DIR $1
;------------------------------------------------------------
IF $1  EXISTS.P /$$$$/ ERA $1
IF $2  NULL.Q   /$$$$/
SUBMIT ERAQ $2 $3 $4 $5 $6 $7 $8 $9
```

End Listing Two

Listing Three

```
             ASM.SUB  -  Simple 68K Assemble and Link

IF $1 NULL.S /$$$$/ ERA $1.O
IF FILE1.BAK EXISTS.S* /$$$$/ ERA FILE1.O\PIP B:=FILE1.S
IF FILE2.BAK EXISTS.S* /$$$$/ ERA FILE2.O\PIP B:=FILE2.S
IF FILE3.BAK EXISTS.S* /$$$$/ ERA FILE3.O\PIP B:=FILE3.S
IF FILE4.BAK EXISTS.S* /$$$$/ ERA FILE4.O\PIP B:=FILE4.S
ERA *.BAK
IF FILE1.O   EXISTS.S  /$$$$/ A:AS68 -S A: -L FILE1.S
IF FILE2.O   EXISTS.S  /$$$$/ A:AS68 -S A: -L FILE1.S
IF FILE3.O   EXISTS.S  /$$$$/ A:AS68 -S A: -L FILE1.S
IF FILE4.O   EXISTS.S  /$$$$/ A:AS68 -S A: -L FILE1.S
A:LO68 -R FILE1.O FILE2.O FILE3.O FILE4.O
```

End Listings

FORTRAN PROGRAMMERS

Discover why
you should be using
F77L
the complete implementation
of the ANSI FORTRAN 77
Standard for the IBM PC and
compatibles.
If you are serious about your
FORTRAN programming, you
should be using F77L.
$477

Lahey Computer Systems, Inc.
31244 Palos Verdes Drive West, Suite 243
Rancho Palos Verdes, California 90274
(213) 541-1200
Serving the FORTRAN community since 1969

Circle **no. 67** on reader service card.

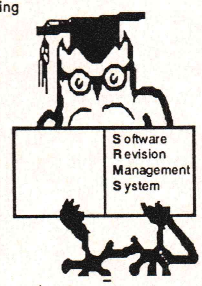
TOTAL RECALL

FOR $104.95

VISA

Now you can retrieve everything you entered during program development -- from version one thru all updates. SRMS does it with a complete source utility at an affordable price.

You can retrieve specific versions of a program, make changes and reinstate the source while recording when, why and where changes were made.



All versions are stored in a single library without duplication of common code or text -- saves disk space. You can also store comments specific to each version -- provides complete development history and documentation of the program.

SRMS supports recall and edit of programs written in BASIC, FORTRAN, PASCAL (including Turbo Pascal), C and ASSEMBLY CODE.

Requires MS or PC DOS, Version 2 and up with 128K and one disk (floppy or hard).

Quilt Computing 7048 Stratford Road
Woodbury, MN 55125
(612) 739-4650

Circle **no. 107** on reader service card.

Finally. BSW-Make.

The Boston Software Works now brings a <u>complete</u> implementation of the Unix "make" facility to MS-DOS. No more recompiling every file in sight after a small edit; no more wondering if you've really rebuilt every module affected by an edit. Just type "make" and BSW-Make automatically builds your product quickly, efficiently and correctly.

BSW-Make supports:

- most compilers and assemblers
- MS-DOS or PC-DOS v2.00 or later
- macros for parameterized builds
- default rules
- MS-DOS pathnames
- any MS-DOS machine (192K minimum)

Only $69.95 postpaid (Mass. residents add 5% sales tax)

The Boston Software Works
120 Fulton Street, Boston, MA 02109
(617) 367-6846

Circle **no. 136** on reader service card.

LEARN PROLOG

Interactively and Quickly with PROLOG-86

Ideal for Artificial Intelligence and Prototyping

A complete *Prolog Interpreter, Tutorial,* and set of *Sample Programs:*

☐ **Modify and write Expert Systems.**
Use the simple "Guess the animal" example on the Tutorial or use the sophisticated system for Section 318 of the US Tax Code written by one of the PROLOG-86 authors and published in the March, 1985 issue of Dr. Dobb's Journal.

☐ **Understand Natural Language**
Use the sample program that produces a dBase DISPLAY command as output.

☐ **Write Symbolic Math or Abstract Problem Solving Applications**
This is a complete Prolog program to convert from Farenheit to Centigrade: f_to_c(C,F):- C is(F-32) *5/9. Planning programs and games are included to help you learn.

☐ **BECOME FAMILIAR WITH PROLOG IN ONE EVENING.**

Programming experience is not required, but a logical mind is. Serious development of experimental systems is practical with PROLOG-86. 1 or 2 pages in Prolog is often equivalent to 10 or 15 in C.

RECENT IMPROVEMENTS: MSDOS commands, on-line help, load Editor.

AVAILABILITY: All MSDOS, PCDOS systems.

ONLY
$125
<u>Full refund</u> if not satisfied during first 30 days.

Solution Systems™

335-D Washington St.
Norwell, Mass. 02061
617-659-1571
800-821-2492

Circle **no. 148** on reader service card.

LEARN LISP

Interactively and Write Realistic Programs with LISP-86 for Only $75

A "COMMON LISP" compatible Tutorial, Interpreter, Debugging, and Pretty Printer plus a Fast, Full Screen Editor, Samples and Help

☐ **Start Easily and Quickly:**
A complete, modular tutorial helps you learn LISP at your own pace. An integrated, interactive environment provides all of the elements needed to enter, modify, analyze and debug programs.

☐ **Natural Language, Expert Systems and Mailing List:**
Natural Language concepts are illustrated by a phone number retrieval program. Choose the best word processing program for you with the Expert System. File handling and typical data processing work are demonstrated by a Mailing List program.

☐ **Write Realistic Programs:**
Short examples and substantial programs of about 10 pages in length help you learn by modifying, studying and using the key concepts needed to write programs of 1000 lines or more.

☐ **The "COMMON LISP" Standard:**
LISP-86 includes a 230+ function subset of the "COMMON LISP" Standard. Use extras like the MSDOS interface and graphics. Or use "strict compatibility" to make programs written in LISP-86, with no changes, work with other COMMON LISP systems like VAX LISP, GC/LISP or LISP Machine LISP.

Use and Modify the "Which Word Processor?" program
to learn about EXPERT SYSTEMS.

Runs on any MSDOS or PCDOS System: Not copy-protected, LISP-86 is available in just about any 3", 5" or 8" format. PC compatibles can run LISP-86 with no installation procedure. 192K memory and 1 floppy drive are the minimums required.

For Beginners and Experienced Programmers

ONLY
$75
<u>Full refund</u> if not satisfied during first 30 days.

Solution Systems™

335-B Washington St.
Norwell, Mass. 02061
617-659-1571
800-821-2492

Circle **no. 149** on reader service card.

ProDOS and the RAM Disk

by Alfred Steele

I have a Synetix Flashcard with 288K of RAM that I use with Apple's CP/M, Pascal, and DOS 3.3. When I got my card more than two years ago, there was no ProDOS. After using ProDOS several times, I knew that I could not live without my RAM disk, so I decided to roll my own driver. I did several things to speed up the process of writing the driver. I used only 256K of the 288K memory on the Flashcard. The Flashcard uses six banks of memory. Four banks have 64K and the other two have only 16K each. I chose to use only the four 64K banks of memory to save development time and reduce code size. The loss of 32K of storage space is not a problem at this time. With the 256K of RAM in use, I get a RAM disk with 512 blocks of storage space.

disk driver can be installed anywhere in memory, but only three options are given at run time. You may place the driver inside a free space in ProDOS at $FF00. This space may only be free in ProDOS Version 1.01. Later versions of ProDOS may not support the driver at that address. You may also place the driver under the BASIC interpreter or at $300 hex page 3. The reason I advise you to install the driver inside of ProDOS is to support MousePaint, which uses page 3 of memory. Information on how to use the interpreter can be found in the *ProDOS Technical Reference Manual* and *Beneath Apple ProDOS*. Both books are really necessary.

The code for the RAM-disk driver is not hard to follow. The RAM-disk driver code that will be relocated to any address starts at label SSDSTART

Using a RAM disk speeds hi-res display by a factor of four.

This is Version 1.3 of the RAM-disk driver (see Listing, page 85). Version 1.0 was larger and faster but not relocatable. It had to be loaded in page 3 of memory. Version 1.1 fixed bugs in the installation program. Version 1.2 is the first version inich the RAM-disk driver code is small enough to fit inside of a free space in ProDOS. The program is completely relocatable anywhere in memory. One side effect of making the driver smaller and relocatable is that it is slower than in the other versions.

Version 1.3 fixes some errors in the installation code and adds more user prompts. This version of the RAM-

Alfred Steele, Box 6296, APO NY 09012

and ends at ENDSSD. The routine is only 8E hex (142 decimal) bytes long. The main part of the installation code starts at label MAIN. This is a series of subroutines to check if the RAM disk has already been formatted. If this is a first time installation, the program title and the volume name of the RAM disk are displayed. The driver code is relocated to the address of your choice. The ProDOS active devices are listed and the count is updated. The address of the device driver is placed in the vector table for Slot 5, Drive 1. The RAM-disk volume directory information is written to the RAM disk and the volume bit map is written to disk. Information on the diskette volume can be found in Chapter 4 of *Beneath Apple ProDOS* and Appendix B of the *ProDOS Technical*

Reference Manual.

The program has been written to be easy to use. If you try to install the driver more than once, the program will display a message that a driver has already been installed and abort. If the driver finds a formatted volume directory header on the RAM disk it will ask you if you want to clear it or not. If you type N, the program will install the driver but won't clear the RAM-disk directory. If you type Y, the program will install the driver and reformat the RAM disk. If any other driver, such as a hard disk driver, is already installed in the active device vector for Slot 5, Drive 1, the program will abort with an error message.

Once the RAM-disk driver is installed you can access the RAM disk using standard ProDOS commands and utilities. You can catalog the RAM disk using either the command CAT /RAM or CAT,S5,D1. If you want to copy files to the RAM disk use your copy of ProDOS FILER [*or see the article "Adding a COPY Command to ProDOS" on page 54 of this issue—ed*]. The system intergradation is clean and efficient and provides super fast loading and storing of any type of file.

One benchmark that I ran using the RAM disk consisted of loading high-resolution pictures to the screen. I made up a ProDOS test disk with a short BASIC program to load 16 different hi-res pictures as fast as possible. Using Apple's Disk II it took about 35 seconds to display all 16 pictures. Using the same program and pictures loaded to the RAM disk it only took 8.3 seconds to display all 16 pictures. The program runs about 4.2 times faster using the RAM disk for an effective I/O transfer speed of 15.9K per second vs. the Disk II transfer speed of 3.8K per second.

For those who don't want to type in more than 900 lines of code and comments, I will send you a copy of the source and object code on one Apple ProDOS disk for $15 postpaid anywhere in the United States. Please send a money order because a personal check is difficult to process in West Germany. To assemble the code, you need a copy of the ProDOS assembler/editor, or you can assemble the code under a DOS 3.3 assember and move the object code to a ProDOS disk. My address is:

Alfred Steele
Box 6296
APO NY 09012

DDJ

Reader Ballot
Vote for your favorite feature/article.
Circle Reader Service **No. 196.**

Ram Disk Listing

(Text begins on page 84)

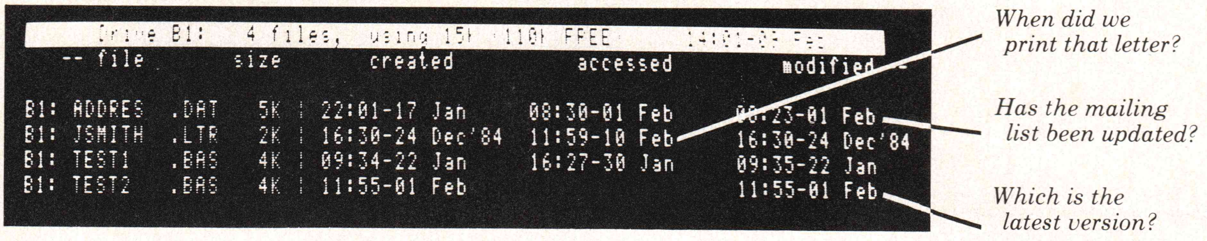
```
SOURCE   FILE #01 =>/RAMDISK.SOURCE/SSD3
0000:             ********************************
0000:             *                              *
0000:             *   FLASHCARD RAMDISK DRIVER   *
0000:             *                              *
0000:             *        VERSION 1.3           *
0000:             *         JULY 1985            *
0000:             *                              *
0000:             *      COPYRIGHT 1985          *
0000:             *      ALFRED STEELE           *
0000:             *                              *
0000:             * THIS PROGRAM MAY BE COPIED   *
0000:             * FOR PERSONAL, NON-PROFIT USE *
0000:             *                              *
0000:             ********************************
0000:             *

0000:                       LST   ON
----- NEXT OBJECT FILE NAME IS /RAMDISK.SOURCE/SSD3.0
2000:        2000           ORG   $2000
2000:             *
2000:             * TEXT STUFF
2000:             *
2000:        0000 EOL       EQU   $00
2000:        008D CR        EQU   $8D
2000:             *
2000:             * ADDRESS OF SSD DRIVER
2000:             *
2000:        0000 TEMPZERO  EQU   $00
2000:        0002 SSDCODE   EQU   $02
2000:             *
2000:             * MLI DISK DRIVE ZERO PAGE
2000:             *
2000:        0001 READ      EQU   $01
2000:        0002 WRITE     EQU   $02
2000:        0006 DIRBLOCKS EQU   $06
2000:        0008 SAVEBYTES EQU   $08
2000:             *
2000:             * DEVICE DRIVER PARAMETERS
2000:             *
2000:        0042 COMMAND   EQU   $42
2000:        0043 UNITNUMB  EQU   $43
2000:        0044 BUFFADR   EQU   $44
2000:        0046 BLOCKNUM  EQU   $46
2000:        0048 RAMBANK   EQU   $48
2000:        004A TEMP      EQU   $4A
2000:             *
2000:             * LOW BYTE ADDRESS OF BLOCK
2000:             * NUMBERS IN SSD RAM DISK.
2000:             *
2000:        00D2 BLOCK1    EQU   $D2
2000:        00D3 BLOCK2    EQU   $D3
2000:        00D4 BLOCK3    EQU   $D4
2000:        00D5 BLOCK4    EQU   $D5
2000:        00D6 BLOCK5    EQU   $D6
2000:        00D7 BLOCK6    EQU   $D7
2000:             *
2000:             * SSD ADDRESS FOR CARD IN SLOT 5
2000:             *
2000:        C0D0 SSDLOW    EQU   $C0D0
2000:        C0D1 SSDHI     EQU   $C0D1
2000:             *
2000:        BEF5 GETBUFF   EQU   $BEF5
2000:        BF00 MLI       EQU   $BF00
2000:        BF31 DEVCNT    EQU   $BF31
2000:        BF32 DEVLST    EQU   $BF32
2000:        BF1A DEVADR51  EQU   $BF1A
2000:             *
2000:             * VALUE OF DEVICE DRIVER POINTER
2000:             * IF THE SLOT AND DRIVE IS NOT
2000:             * BEING USED.
2000:             *
2000:        D0A2 NODEV     EQU   $D0A2
2000:             *
2000:             * BI GLOBAL PAGE ADDRESS
2000:             *
2000:        BE00 WARMDOS   EQU   $BE00
2000:             *
2000:             * HARDWARE LOCATIONS
2000:             *
2000:        C000 KEY       EQU   $C000
2000:        C010 STROBE    EQU   $C010
2000:             *
2000:             * MONITOR SUBROUTINES
2000:             *
2000:        FC58 HOME      EQU   $FC58
2000:        FD8E CROUT     EQU   $FD8E
2000:        FDED COUT      EQU   $FDED
2000:        FF3A BELL      EQU   $FF3A
2000:             *
2000:             ********************************
2000:             *
2000:4C 90 21               JMP   MAIN
2003:             *
2003:             ********************************
2003:             *
2003:             * THIS IS THE SSD RAMDISK DRIVER
2003:             * CODE THAT IS MOVED TO SSDCODE
2003:             * AT THE START OF THIS PROGRAM.
2003:             * THIS ROUTINE MUST START ON A
2003:             * PAGE BOUNDARY. I USE THE DUMMY
2003:             * DS STATEMENT BELOW SO THAT THE
2003:             * ROUTINE WILL START ON A PAGE
2003:             * BOUNDARY. IF YOU CHANGE ANY
2003:             * CODE ABOVE BE SURE TO ADJUST
2003:             * THE DS STATEMENT BEFORE YOU
2003:             * ASSEMBLE AND RUN THE PROGRAM.
2003:             *
2003:             *
2003:        00FD           DS    $FD
2100:             *
2100:             *
2100:D8           SSDSTART  CLD
2101:             *
2101:             * SAVE ALL MLI ZERO PAGE LOC
2101:             * PLUS TWO NEEDED BY DRIVER
2101:             *
2101:AD D3 C0               LDA   $C0D3
2104:A2 08                  LDX   #SAVEBYTES
2106:B5 42        S1        LDA   COMMAND,X
2108:48                     PHA
2109:CA                     DEX
210A:10 FA   2106           BPL   S1
210C:             *
210C:             * COMPUTE WHICH 64K BLOCK WE
210C:             * NEED TO READ OR WRITE TO.
210C:             * EACH 64K BLOCK OF RAM HAS 128
210C:             * PRODOS 512 BYTES BLOCKS IN IT.
210C:             * WE ARE ONLY USING THE 64K
210C:             * BANKS SO ONLY BLOCKS:
210C:             *
210C:             *     BLOCK1    BLOCKS   0-127
210C:             *     BLOCK2    BLOCKS 128-255
210C:             *     BLOCK4    BLOCKS 256-383
210C:             *     BLOCK5    BLOCKS 384-511
```

(Continued on next page)

(Listing continued, text begins on page 84)

```
210C:                  *
210C:                  * ARE BEING USED. WHEN WE KNOW
210C:                  * WHAT BANK WE WILL USE WE MOVE
210C:                  * THAT BANKS LOW BYTE FOR THE
210C:                  * SSD RAM CARD BANK ADDRESS INTO
210C:                  * THE LOW-BYTE OF THE ZERO PAGE
210C:                  * POINTER RAMBANK. THE HI-BYTE
210C:                  * IS SET TO #$C0. IF BLOCKNUM+1
210C:                  * IS NOT ZERO WE NEED TO ACCESS
210C:                  * BLOCKS 256-383 OR 384-511.
210C:                  *
210C:A5 47             COMPUTE   LDA   BLOCKNUM+1
210E:D0 0C     211C              BNE   C2
2110:                  *
2110:                  * BLOCKS 0-127 OR 128-255
2110:                  *
2110:A5 46                       LDA   BLOCKNUM
2112:30 04     2118              BMI   C1
2114:                  *
2114:                  * BLOCKS 0-127
2114:                  *
2114:A9 D2                       LDA   #BLOCK1
2116:D0 0E     2126              BNE   C4
2118:                  *
2118:                  * BLOCKS 128-255
2118:                  *
2118:A9 D3             C1        LDA   #BLOCK2
211A:D0 0A     2126              BNE   C4
211C:                  *
211C:                  * BLOCKS 256-383 OR 384-511
211C:                  *
211C:A5 46             C2        LDA   BLOCKNUM
211E:30 04     2124              BMI   C3
2120:                  *
2120:                  * BLOCKS 256-383
2120:                  *
2120:A9 D5                       LDA   #BLOCK4
2122:D0 02     2126              BNE   C4
2124:                  *
2124:                  * BLOCKS 384-511
2124:                  *
2124:A9 D6             C3        LDA   #BLOCK5
2126:85 48             C4        STA   RAMBANK
2128:                  *
2128:                  * SET UP HI-BYTE OF SSD CARD
2128:                  *
2128:A9 C0                       LDA   #$C0
212A:85 49                       STA   RAMBANK+1
212C:                  *
212C:                  * DECODE TYPE OF COMMAND FOR
212C:                  * RAM DISK DRIVER TO DO.
212C:                  *
212C:A5 42                       LDA   COMMAND
212E:85 4A                       STA   TEMP
2130:F0 48     217A              BEQ   EXIT
2132:                  *
2132:                  * SAVE COMMAND IN Y-REG AND
2132:                  * MASK OUT BITS 1 AND 0.
2132:                  * IF A-REG = ZERO AFTER MASK
2132:                  * THEN THIS IS A VALID READ
2132:                  * OR WRITE COMMAND.
2132:                  *
2132:29 FC                       AND   #$FC
2134:F0 06     213C              BEQ   SETBLOCK
2136:                  *
2136:                  * ERROR COMMAND HANDLER
2136:                  * INVALID COMMAND SENT
2136:                  *
2136:A9 27                       LDA   #$27
2138:85 4A                       STA   TEMP
213A:D0 3E     217A              BNE   EXIT
213C:                  *
213C:                  * READ OR WRITE COMMAND. SET UP
213C:                  * BLOCK NUMBER AND BRANCH TO
213C:                  * READBYTE OR WRITEBYTE.
213C:                  *
213C:                  * EACH 64K BANK HOLDS 128 PRODOS
213C:                  * 512 BYTE BLOCKS. GET THE LOWER
213C:                  * 7 BITS AND SHIFT ONCE LEFT.
213C:                  * THIS WILL MULTPLY THE NUMBER
213C:                  * 0-127 TO 0-254 EVEN VALUES
213C:                  * ONLY. THIS ADJUSTED BLOCK
213C:                  * NUMBER IS USED AS THE HI-BYTE
213C:                  * OF THE ADDRESS IN THE 64K BANK
213C:                  * THE LOW-BYTE IS SET TO ZERO
213C:                  * AND INC FROM 0 TO $FF.
213C:                  *
213C:A5 46             SETBLOCK  LDA   BLOCKNUM
213E:29 7F                       AND   #$7F
2140:0A                          ASL
2141:85 47                       STA   BLOCKNUM+1
2143:8D D1 C0                    STA   SSDHI
2146:                  *
2146:                  * MOVE COMMAND TO A-REG AND
2146:                  * SET UP LOOP COUNT TO RUN
2146:                  * THRU READ OR WRITE TWICE.
2146:                  * EACH LOOP THRU READ OR WRITE
2146:                  * WILL MOVE 256 BYTES.
2146:                  *
2146:A0 00                       LDY   #0
2148:84 46                       STY   BLOCKNUM
```


DATESTAMPER™ has the answers



DateStamper™ keeps your CP/M computer up-to-date!

- avoid erasing the wrong file
- back-up files by date and time
- keep dated tax log of computer use
- simplify disk housekeeping chores

OPERATION: DateStamper extends CP/M 2.2 to automatically record date and time a file is created, read or modified. DateStamper reads the exact time from the real-time clock, if you have one; otherwise, it records the order in which you use files. Disks prepared for datestamping are fully compatible with standard CP/M.
INSTALLATION: Default (relative-clock) mode is automatic. Configurable for any real-time clock, with pre-assembled code supplied for all popular models. Loads automatically at power-on.
UTILITIES: Enhanced SuperDirectory • Powerful, all-function DATSWEEP file-management program with date and time tagging • Installation and configuration utilities
PERFORMANCE: Automatic. Efficient. Versatile. Compatible.

Requires CP/M 2.2. Uses less than 1K memory. Real-time clock is optional.

When ordering please specify format

8" SSSD, Kaypro, Osborne Formats $49
For other formats (sorry, no 96 TPI) add $5.
Shipping and handling $3
California residents add 6% sales tax
MasterCard and Visa accepted

Specialized versions of this and other software available for the Kaypro.
CP/M is a registered trademark of Digital Research, Inc.

Write or call for further information

Plu*Perfect Systems
BOX 1494 • IDYLLWILD, CA 92349 • 714-659-4432

Circle no. 69 on reader service card.

```
214A:A2 02                      LDX    #2
214C:                      *
214C:                      * READ OR WRITE ONE 512 BYTE
214C:                      * PRODOS BLOCK.
214C:                      *
214C:8C D0 C0              SSDIO      STY    SSDLOW
214F:84 4A                            STY    TEMP
2151:                      *
2151:                      * CHECK A-REG TO SEE IF WE NEED
2151:                      * TO DO A READ OR WRITE.
2151:                      *
2151:                      *   A-REG = $01 FOR READ
2151:                      *   A-REG = $02 FOR WRITE
2151:                      *
2151:                      * ROTATE A-REG THRU CARRY AND
2151:                      * CHECK IF CARRY SET OR CLEAR.
2151:                      * IF CARRY SET THEN READ. IF
2151:                      * CARRY CLEAR THEN WRITE.
2151:                      *
2151:A5 42                            LDA    COMMAND
2153:4A                               LSR
2154:90 0B      2161                  BCC    WRITEBYTE
2156:                      *
2156:A0 00                 READBYTE   LDY    #0
2158:B1 48                            LDA    (RAMBANK),Y
215A:A4 4A                            LDY    TEMP
215C:91 44                            STA    (BUFFADR),Y
215E:18                               CLC
215F:90 08      2169                  BCC    CONT
2161:                      *
2161:                      * WRITE BYTE TO RAMDISK
2161:                      *
2161:B1 44                 WRITEBYTE  LDA    (BUFFADR),Y
2163:A0 00                            LDY    #0
2165:91 48                            STA    (RAMBANK),Y
2167:A4 4A                            LDY    TEMP
2169:                      *
2169:                      * COMMON CODE TO INC TO NEXT
2169:                      * BYTE TO READ OR WRITE
2169:                      *
2169:C8                    CONT       INY
216A:D0 E0      214C                  BNE    SSDIO
216C:                      *
216C:E6 45                            INC    BUFFADR+1
216E:E6 47                            INC    BLOCKNUM+1
2170:A5 47                            LDA    BLOCKNUM+1
2172:8D D1 C0                         STA    SSDHI
2175:CA                               DEX
2176:D0 D4      214C                  BNE    SSDIO
2178:                      *
2178:84 4A                            STY    TEMP
217A:                      *
217A:                      * THIS PART OF THE ROUTINE IS
217A:                      * ENTERED IF THE STATUS, READ
217A:                      * OR WRITE I/O IS COMPLETE.
217A:                      *
217A:                      * SSD EXIT RETURN
217A:                      *
217A:A4 4A                 EXIT       LDY    TEMP
217C:A2 00                            LDX    #0
217E:68                    EX1        PLA
217F:95 42                            STA    COMMAND,X
2181:E8                               INX
2182:E0 09                            CPX    #SAVEBYTES+1
2184:D0 F8      217E                  BNE    EX1
2186:                      *
2186:AD D2 C0                         LDA    $C0D2
2189:18                               CLC
218A:98                               TYA
218B:F0 01      218E                  BEQ    EX2
218D:38                               SEC
218E:                      *
218E:60                    EX2        RTS
218F:EA                    ENDSSD     NOP
2190:                      *
2190:                      ********************************
2190:                      *
2190:                      * THIS IS THE MAIN SET OF JSR
2190:                      * STATEMENTS TO INSTALL AND
2190:                      * INIT THE RAMDISK.
2190:                      *
2190:20 50 22              MAIN       JSR    CHECKDEV
2193:20 97 23                         JSR    WHERETO
2196:20 4F 25                         JSR    TITLE
2199:20 64 25                         JSR    DISPVOL
219C:                      *
219C:20 B4 21                         JSR    RELOCATE
219F:20 C1 21                         JSR    SETDEV
21A2:20 D7 21                         JSR    SETVECTOR
21A5:                      *
21A5:                      * CHECK CLEAR DIRECTORY FLAG
21A5:                      * IF CLEARDIR = 1 THEN SKIP
21A5:                      * THE ROUTINES TO WRITE A NEW
21A5:                      * DIRECTORY TO THE RAMDISK AND
21A5:                      * SKIP THE ROUTINE TO WRITE A
21A5:                      * NEW BITMAP TO THE RAMDISK.
21A5:                      *
21A5:AD 4A 26                         LDA    CLEARDIR
21A8:D0 09      21B3                  BNE    MN1
21AA:                      *
21AA:                      * DO A NORMAL FIRST TIME INIT
21AA:                      *
21AA:20 E2 21                         JSR    CLEAREND
21AD:20 EF 21                         JSR    WRITEDIR
21B0:20 35 22                         JSR    BITMAP
21B3:60                    MN1        RTS
21B4:                      *
21B4:                      ********************************
21B4:                      *
21B4:                      * THIS ROUTINE IS USED TO MOVE
21B4:                      * THE SSD RAM DISK DRIVER TO
21B4:                      * THE ADDRESS OF SSDCODE.
21B4:                      * THE ROUTINE IS COMPLETELY
21B4:                      * RELOCATABLE AND DOES NOT HAVE
21B4:                      * TO BE ON A PAGE BOUNDARY.
21B4:                      *
21B4:A0 00                 RELOCATE   LDY    #0
21B6:B9 00 21              R1         LDA    SSDSTART,Y
21B9:91 02                            STA    (SSDCODE),Y
21BB:C8                               INY
21BC:C0 8F                            CPY    #ENDSSD-SSDSTART
21BE:D0 F6      21B6                  BNE    R1
21C0:60                               RTS
21C1:                      *
```

(Continued on next page)

WINDOWS FOR DATA™

Featuring One-Step Data Entry◆

Now you can code fast, powerful data entry windows, improve user convenience – reduce input errors.

All the power, convenience and flexibility of the #1 window utility for the IBM PC. Our WINDOWS FOR C™ combined with a professional window-based data entry system.

Complete control over screen display and entry of data within a convenient flexible window environment.

	WINDOWS FOR C	WINDOWS FOR DATA (Includes WINDOWS FOR C)
PCDOS	**$ 195**	**$ 295**
PC/XENIX	**$ 395**	**$ 595**
UNIX	**CALL**	**CALL**

WINDOWS FOR DATA™ provides versatile, easy-to-use data entry functions that operate within windows.

CAPABILITIES INCLUDE:

- **Pop-up data entry windows**
- **Multiple field types**
- **Data validation functions**
- **Field-specific & context-sensitive help**
- **Lotus-style menu design**
- **Single field entry option**
- **Date, time and string utilities**
- **Dynamic control of data-entry environment**

◆ User input to data-structure variables without intervening code.

Vermont Creative Software
21 Elm Ave.
Richford, VT 05476
802-848-7738, ext. 31

Full source available. Master Card & Visa accepted. Shipping $ 3.50 . VT residents add 4% tax.

Circle **no. 157** on reader service card.

Ram Disk Listing

(Listing continued, text begins on page 84)

```
21C1:                  ******************************
21C1:                  *
21C1:                  * THIS ROUTINE IS USED TO MAKE
21C1:                  * ROOM IN THE DEVICE LIST OF
21C1:                  * ACTIVE DEVICES FOR THE RAM
21C1:                  * DISK DRIVE IDENTIFICATION.
21C1:                  *
21C1:AE 31 BF          SETDEV     LDX   DEVCNT
21C4:E8                           INX
21C5:8E 31 BF                     STX   DEVCNT
21C8:                  *
21C8:BD 31 BF          SD1        LDA   DEVLST-1,X
21CB:9D 32 BF                     STA   DEVLST,X
21CE:CA                           DEX
21CF:D0 F7    21C8                BNE   SD1
21D1:                  *
21D1:                  * STORE THE RAM DISK IN LIST
21D1:                  *
21D1:A9 50                        LDA   #$50
21D3:8D 32 BF                     STA   DEVLST
21D6:60                           RTS
21D7:                  *
21D7:                  ******************************
21D7:                  *
21D7:                  * INSTALL RAMDISK DRIVER VECTOR
21D7:                  *
21D7:A5 02             SETVECTOR  LDA   SSDCODE
21D9:8D 1A BF                     STA   DEVADR51
21DC:A5 03                        LDA   SSDCODE+1
21DE:8D 1B BF                     STA   DEVADR51+1
21E1:60                           RTS
21E2:                  *
21E2:                  ******************************
21E2:                  *
21E2:                  * CLEAR BUFFER FROM END OF DISK
21E2:                  * DATA TO END OF DISK BUFFER.
21E2:                  *
21E2:A0 00             CLEAREND   LDY   #0
21E4:98                           TYA
21E5:99 82 26          CE         STA   MIDBUFF,Y
21E8:99 82 27                     STA   MIDBUFF+$100,Y
21EB:C8                           INY
21EC:D0 F7    21E5                BNE   CE
21EE:60                           RTS
21EF:                  *
21EF:                  ******************************
21EF:                  *
21EF:                  * CALL MLI TO WRITE OUT THE
21EF:                  * SSD RAM DISK VOLUME DIRECTORY
21EF:                  *
21EF:A9 06             WRITEDIR   LDA   #DIRBLOCKS
21F1:8D 7E 26                     STA   BUFFER+39
21F4:A9 02                        LDA   #$02
21F6:8D 4F 26                     STA   WRITEBLOCK
21F9:                  *
21F9:20 00 BF                     JSR   MLI
21FC:81                           DB    $81
21FD:4B 26                        DW    MLIWRITE
21FF:                  *
21FF:                  * CLEAR AND SET BLOCKS
21FF:                  * 3 THRU DIRBLOCKS OF
21FF:                  * VOLUME DIRECTORY. WE HAVE TO
21FF:                  * SET UP THE LAST/NEXT BLOCK
21FF:                  * NUMBERS IN THE FIRST FOUR (4)
21FF:                  * BYTES OF EACH BLOCK.
21FF:                  *
21FF:A2 03                        LDX   #3
2201:20 28 22          CB1        JSR   CLEARBUFF
2204:                  *
2204:CA                           DEX
2205:8E 57 26                     STX   BUFFER
2208:E8                           INX
2209:E8                           INX
220A:                  *
220A:E0 06                        CPX   #DIRBLOCKS
220C:D0 07    2215                BNE   CB2
220E:                  *
220E:A9 00                        LDA   #0
2210:8D 59 26                     STA   BUFFER+2
2213:F0 03    2218                BEQ   CB3
2215:                  *
2215:8E 59 26          CB2        STX   BUFFER+2
2218:                  *
2218:                  * WRITE VOLUME DIRECTORY BLOCK
2218:                  * TO SSD RAM DISK.
2218:                  *
2218:CA                CB3        DEX
2219:8E 4F 26                     STX   WRITEBLOCK
221C:                  *
221C:20 00 BF                     JSR   MLI
221F:81                           DB    $81
2220:4B 26                        DW    MLIWRITE
2222:                  *
2222:E8                           INX
2223:E0 06                        CPX   #DIRBLOCKS
2225:D0 DA    2201                BNE   CB1
2227:60                           RTS
2228:                  *
2228:                  ******************************
2228:                  *
2228:                  * CLEAR ENTIRE FILE BUFFER
2228:                  *
```


ATTENTION

C-PROGRAMMERS

File System Utility Libraries

All products are written entirely in K& RC. Source code included, No Royalties, Powerful & Portable.

BTree Library **75.00**

- High speed random and sequential access.
- Multiple keys per data file with up to 16 million records per file.
- Duplicate keys, variable length data records.

ISAM Driver **40.00**

- Greatly speeds application development.
- Combines ease of use of database manager with flexibility of programming language.
- Supports multi key files and dynamic index definition.
- Very easy to use.

Make **59.00**

- Patterned after the UNIX utility.
- Works for programs written in every language.
- Full macros, File name expansion and built in rules.

Full Documentation and Example Programs Included.

For more information call or write:

softfocus

1343 Stanbury Drive
Oakville, Ontario, Canada
L6L 2J5
(416) 825-0903
(416) 844-2610

Credit cards accepted.

Dealer inquiries invited.

Introducing SMK™, the

SEIDL MAKE UTILITY

SMK is an automatic software product generation utility for MS™-DOS. With SMK, you can update and track every module in your program. When changes are made to any module, SMK will recompile or reassemble changed modules and modules effected by the changes, and relink the modules in the proper order. SMK will work with any compiler, assembler and linker.

Advanced SMK Features Include:

- Proprietary dependency algorithm analyzes *all* dependencies before rebuilding *any* files.
- SMK understands complicated dependencies involving nested include files, source, and object code libraries.
- High-level dependency definition language makes setting up dependencies easy. Supports parameterized macros, local variables, constants, include files, command line parameters, line and block comments.
- Batch source code editor that allows automatic *source* file updating is included.
- Full pathname and directory support.
- Typeset user's manual and excellent error diagnostics make SMK easy to learn and easy to use.

SMK Introductory Price —
Save 40% — $84.00

SMK List Price (effective Jan. 86): $140.00
(include $3.50 postage & handling)

SEIDL COMPUTER ENGINEERING
1163 E. Ogden Ave., Suite 705-171
Naperville, IL 60540
(312) 983-5477

Circle **no. 114** on reader service card.

```
2228:A0 00            CLEARBUFF LDY   #0
222A:98                         TYA
222B:99 57 26         CL1       STA   BUFFER,Y
222E:99 57 27                   STA   BUFFER+$100,Y
2231:C8                         INY
2232:D0 F7    222B              BNE   CL1
2234:60                         RTS
2235:                 *
2235:                 ******************************
2235:                 *
2235:                 * SET ALL BLOCKS NOT USED IN
2235:                 * RAM DISK TO HEX $FF TO SHOW
2235:                 * THAT THOSE BLOCKS ARE FREE.
2235:                 * SET FIRST BYTE TO SHOW THAT
2235:                 * BLOCKS 0 THRU DIRBLOCKS ARE
2235:                 * IN USE.
2235:                 *
2235:A9 01            BITMAP    LDA   #$01
2237:8D 57 26                   STA   BUFFER
223A:A0 3F                      LDY   #63
223C:A9 FF                      LDA   #$FF
223E:                 *
223E:99 57 26         BM2       STA   BUFFER,Y
2241:88                         DEY
2242:D0 FA    223E              BNE   BM2
2244:                 *
2244:A9 06                      LDA   #DIRBLOCKS
2246:8D 4F 26                   STA   WRITEBLOCK
2249:                 *
2249:                 * WRITE OUT BIT MAP TO SSD
2249:                 * RAM DISK.
2249:                 *
2249:20 00 BF                   JSR   MLI
224C:81                         DB    $81
224D:4B 26                      DW    MLIWRITE
224F:                 *
224F:60                         RTS
2250:                 *
2250:                 ******************************
2250:                 *
2250:                 * THIS ROUTINE IS USED TO CHECK
2250:                 * FOR A DEVICE DRIVER ALREADY
2250:                 * INSTALLED FOR SLOT AND DRIVE
2250:                 * WE WANT TO USE. I USE SLOT 5
2250:                 * DRIVE 1 FOR THE RAMDISK DRIVER
2250:                 * IF THE ADDRESS AT SLOT 5 DRIVE
2250:                 * 1 DOES NOT POINT TO $D0A2 THE
2250:                 * PROGRAM WILL ABORT WITH AN
2250:                 * ERROR MESSAGE. IF WE FIND NO
2250:                 * DRIVER INSTALL I READ BLOCK 2
2250:                 * OF THE RAMDISK AND COMPARE IT
2250:                 * WITH THE VOLUME DIRECTORY
2250:                 * HEADER INFORMATION AT BUFFER.
2250:                 * IF THE INFORMATION IS THE SAME
2250:                 * A MESSAGE IS PRINTED ASKING
2250:                 * THE USER IF HE WANTS TO ZERO
2250:                 * THE DIRECTORY ON THE RAMDISK
2250:                 * OR NOT. IF WE WANT TO CLEAR
2250:                 * THE DIRECTORY I SET CLEARDIR
2250:                 * TO ZERO. IF WE DON'T WANT TO
2250:                 * CLEAR THE DIRECTORY I SET
2250:                 * CLEARDIR TO ONE.
2250:                 *
2250:AD 1A BF         CHECKDEV  LDA   DEVADR51
2253:C9 A2                      CMP   #>NODEV
2255:D0 7A    22D1              BNE   DEVABORT
2257:                 *
2257:AD 1B BF                   LDA   DEVADR51+1
225A:C9 D0                      CMP   #<NODEV
225C:D0 73    22D1              BNE   DEVABORT
225E:                 *
225E:                 * LETS TRY AND READ THE RAM DISK
225E:                 * DIRECTORY AT BLOCK 2 AND
225E:                 * COMP IT TO SOME OF THE BYTES
225E:                 * AT ADDR BUFFER TO SEE IF THE
225E:                 * RAMDISK MIGHT HAVE A FORMATTED
225E:                 * DIRECTORY ON IT.
225E:                 *
225E:A9 01                      LDA   #READ
2260:85 42                      STA   COMMAND
2262:                 *
2262:                 * ADDRESS OF READ BUFFER
2262:                 *
2262:A9 82                      LDA   #>MIDBUFF
2264:85 44                      STA   BUFFADR
2266:A9 26                      LDA   #<MIDBUFF
2268:85 45                      STA   BUFFADR+1
226A:                 *
226A:                 * BLOCK NUMBER TO READ
226A:                 *
226A:A9 02                      LDA   #$02
226C:85 46                      STA   BLOCKNUM
226E:A9 00                      LDA   #$00
2270:85 47                      STA   BLOCKNUM+1
2272:                 *
2272:                 * READ THE RAMDISK USING DRIVER
2272:                 * AT SSDSTART IN THIS PROGRAM
2272:                 *
2272:20 00 21                   JSR   SSDSTART
2275:                 *
2275:                 * WE WILL NOW ASSUME AT THERE
2275:                 * IS THE INFORMATION IN BLOCK 2
2275:                 * OF THE RAMDISK AT ADDRESS
2275:                 * MIDBUFF. COMPARE THREE SETS OF
2275:                 * BYTES TO SEE IF IT MATCHS A
2275:                 * VOLUMN DIRECTORY HEADER BLOCK.
2275:                 * IF ANY BYTE DOES NOT MATCH
2275:                 * THE ROUTINE JUMPS TO NODIR
2275:                 * IF ALL THREE SETS OF BYTES
2275:                 * MATCH I ASK USER IF HE WANTS
2275:                 * TO CLEAR THE DIR OR NOT.
2275:                 *
2275:A2 00                      LDX   #$00
2277:BD 57 26         CD0       LDA   BUFFER,X
227A:DD 82 26                   CMP   MIDBUFF,X
227D:D0 4C    22CB              BNE   NODIR
```

(Continued on next page)

Sidekick for CP/M!

Write-Hand-Man

Desk Accessories for CP/M

NEW! Now with automatic screen refresh!

Suspend CP/M applications such as WordStar, dBase, and SuperCalc, with a single keystroke and look up phone numbers, edit a notepad, make appointments, view files and directories, communicate with other computers, and do simple arithmetic. Return to undisturbed application! All made possible by **Write-Hand-Man.** Ready to run after a simple terminal configuration! No installation required.

Don't be put down by 16 bit computer owners. Now **any** CP/M 2.2 machine can have the power of *Sidekick.*

Bonus! User extendable! Add your own applications.

$49.95 plus tax (California residents), shipping included! Volume and dealer discounts.

Available on IBM 8 inch and Northstar 5 inch disks. Other 5 inch formats available with a $5.00 handling charge. CP/M 2.2 required; CP/M 3 not supported.

COD or checks ok, no credit cards

Poor Person Software
3721 Starr King Circle
Palo Alto, CA 94306
tel 415-493-3735

Write-Hand-Man trademark of **Poor Person Software,** CP/M trademark of Digital Research, *Sidekick* trademark of Borland International, dBase trademark of Ashton-Tate, WordStar trademark of Micropro, SuperCalc a trademark of Sorcim.

Circle no. **169** on reader service card.

WIZARD C

Discover the powers of Wizard C for yourself!

"...written by someone who has been in the business a while. This especially shows in the documentation."

Computer Language
February, 1985

" Wizard's got the highest marks for support."

"The Wizard compiler had excellent diagnostics; it would be easier writing portable code with it than with any other compiler we tested."

Dr. Dobb's Journal
August, 1985

Full Lint checking, six memory models, 8087 support, in-line assembly language, ROMable data support, full library source code. Cross-compilers are available on VAX/VMS and UNIX machines.

(617) 641-2379 **Only $450.**

WIZARD
SYSTEMS SOFTWARE, INC.

11 Willow Court
Arlington, MA 02174

Circle no. **116** on reader service card.

Ram Disk Listing (Listing continued, text begins on page 84)

```
227F:                   *
227F:E8                          INX
2280:E0 04                       CPX     #$04
2282:D0 F3    2277               BNE     CD0
2284:                   *
2284:A2 14                       LDX     #$14
2286:BD 57 26           CD1      LDA     BUFFER,X
2289:DD 82 26                    CMP     MIDBUFF,X
228C:D0 3D    22CB               BNE     NODIR
228E:                   *
228E:E8                          INX
228F:E0 25                       CPX     #$25
2291:D0 F3    2286               BNE     CD1
2293:                   *
2293:A2 27                       LDX     #$27
2295:BD 57 26           CD2      LDA     BUFFER,X
2298:DD 82 26                    CMP     MIDBUFF,X
229B:D0 2E    22CB               BNE     NODIR
229D:                   *
229D:E8                          INX
229E:E0 2B                       CPX     #$2B
22A0:D0 F3    2295               BNE     CD2
22A2:                   *
22A2:                   * ASK USER IF HE WANT TO ZERO
22A2:                   * DIRECTORY OR NOT. IF THE USER
22A2:                   * WANTS TO ZERO THE DIRECTORY
22A2:                   * JUST CONTINUE WITH THE INSTALL
22A2:                   * PROGRAM. IF THE USER DOES NOT
22A2:                   * WANT TO ZERO THE DIRECTORY
22A2:                   * DO A JUMP TO THE DOS WARMSTART
22A2:                   *
22A2:20 58 FC                    JSR     HOME
22A5:20 3A FF                    JSR     BELL
22A8:                   *
22A8:A0 00                       LDY     #0
22AA:B9 EF 22           CD3      LDA     DIRFOUND,Y
22AD:C9 00                       CMP     #EOL
22AF:F0 09    22BA               BEQ     CD4
22B1:                   *
22B1:09 80                       ORA     #$80
22B3:20 ED FD                    JSR     COUT
22B6:C8                          INY
22B7:4C AA 22                    JMP     CD3
22BA:                   *
22BA:20 41 25           CD4      JSR     GETKEY
22BD:C9 59                       CMP     #'Y'
22BF:F0 0A    22CB               BEQ     NODIR
22C1:                   *
22C1:C9 4E                       CMP     #'N'
22C3:D0 F5    22BA               BNE     CD4
22C5:                   *
22C5:                   * THE USER DOES NOT WANT TO
22C5:                   * CLEAR THE DIRECTORY.
22C5:                   *
22C5:A9 01                       LDA     #$01
22C7:8D 4A 26                    STA     CLEARDIR
22CA:60                          RTS
22CB:                   *
22CB:                   * WE WANT TO CLEAR THE DIRECTORY
22CB:                   * ON THE RAMDISK SO SET FLAG FOR
22CB:                   * CLEAR AND RETURN TO ROUTINE.
22CB:                   *
22CB:A9 00              NODIR    LDA     #$00
22CD:8D 4A 26                    STA     CLEARDIR
22D0:60                          RTS
22D1:                   *
22D1:                   * THIS PART OF THE ROUTINE IS
22D1:                   * ENTERED IF WE FIND A DEVICE
22D1:                   * DRIVER ADDRESS THAT DOES NOT
22D1:                   * POINT TO THE NO DEVICE DRIVER
22D1:                   * ACTIVE ADDRESS OR TO THE
22D1:                   * ADDRESS WHERE WE WANT TO PUT
22D1:                   * OUR CODE. THERE COULD BE A
22D1:                   * HARD DISK OR OTHER STORAGE
22D1:                   * DEVICE ALREADY INSTALL FOR
22D1:                   * THAT SLOT/DRIVE.
22D1:                   *
22D1:20 58 FC           DEVABORT JSR     HOME
22D4:20 3A FF                    JSR     BELL
22D7:                   *
22D7:A0 00                       LDY     #0
22D9:B9 4B 23           DA1      LDA     ABORTMSG,Y
22DC:C9 00                       CMP     #EOL
22DE:F0 09    22E9               BEQ     DA2
22E0:                   *
22E0:09 80                       ORA     #$80
22E2:20 ED FD                    JSR     COUT
22E5:C8                          INY
22E6:4C D9 22                    JMP     DA1
22E9:                   *
22E9:20 3A FF           DA2      JSR     BELL
22EC:4C 00 BE                    JMP     WARMDOS
22EF:                   *
22EF:                   **********************************
22EF:                   *
22EF:                   * DIRECTORY FOUND MESSAGE
22EF:                   *
22EF:8D 8D 8D 8D        DIRFOUND DFB     CR,CR,CR,CR
22F3:8D 8D 8D 8D                 DFB     CR,CR,CR,CR
22F7:20 20 20 20                 ASC     '
2303:44 49 52 45                 ASC     'DIRECTORY      FOUND'
2312:8D 8D                       DFB     CR,CR
2314:20 20 20 20                 ASC     '                    '
```

(Continued on page 92)

SUPER-CHARGE your directories for only $39.95

Say goodbye to path names and unleash the full power of DOS on your IBM Personal Computer. With SuperPATH™ from Martin Scot, you can run any program from any directory, from any disk, anytime.

SEE THE BIG PICTURE.
Tired of playing hide and seek with your files? SuperPATH tells you where your files are, instantly. Anywhere on your disk.

EXPLOSIVE PERFORMANCE.
Program your directories. To display just the files you want to see, in any format, sorted or double sorted. To set up your keyboard macros for each new directory you enter. To back up your files automatically when you leave a directory.
Or, you can use SuperPATH's batch building option to create your own file management utilities.

NO RISK.
Comes with a 30 day money-back guarantee.

CALL (206) 527-9605 to order SuperPATH.

MARTIN SCOT
4515 Purdue N.E. Seattle, WA 98105

Circle **no. 167** on reader service card.

RP/M2™ creates

CP/M©2.2 compatible

IBM PC

1. Remove the 8088
2. Install the NEC µPD70108
3. Boot PC RP/M2

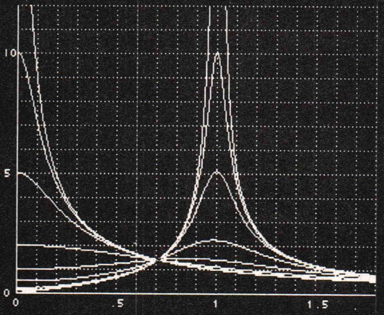
MSDOS and CP/M 2.2 capability coexist in your IBM PC. The NEC µPD70108 CPU chip is a fast 8088 that can also execute 8080 machine code. PC RP/M2 is standard 2.2 compatible RP/M2 with our CBIOS for the IBM PC. System disk with manual and NEC µPD70108 $129. Shipping $5 ($10 nonUS)

Micro Methods, Inc.

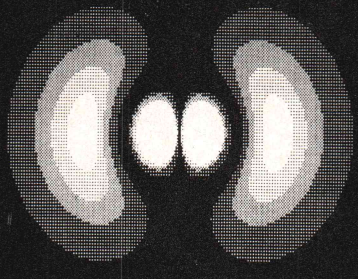
118 SW First St. - Box G
Warrenton, OR 97146
(503)861-1765

isys forth

for the Apple®] [



Parallel Resonance with Damping
BASIC 213 sec   ISYS FORTH 20 sec



Hydrogen 3p Orbital Cross-section
BASIC 492 sec   ISYS FORTH 39 sec

ISYS FORTH is a FORTH-83 compiler designed especially for scientific and engineering applications.

- **FASTEST** — Sieve benchmark, 3.3 seconds/pass. Compiles to machine language.
- **FLOATING POINT WITH TRANSCENDENTALS,** single and double precision.
- **16-BIT 65802 SUPPORT** for execution speeds 50-100% faster than the above.
- **FIXED POINT THEORY AND EXAMPLES** (a 30-page chapter). D*/ for double precision fixed point.
- **TURTLE AND CARTESIAN GRAPHICS** with 70-column character set and double hires support.
- **MACRO ASSEMBLER.**
- **DOS 3.3 FILE INTERFACE.**
- **FULL-SCREEN EDITOR.**
- **144-PAGE MANUAL WITH TUTORIAL.**
- **PRICE: $99, NO EXTRA CHARGES.**

ILLYES SYSTEMS
PO Box 2516, Sta A
Champaign, IL 61820
Phone: 217/359-6039

For any Apple] [model, 48K or larger. Apple is a registered trademark of Apple Computer.

Circle **no. 99** on reader service card.

We will do whatever it takes to make DSD86 the best debugger available for the IBM PC.

For starters, we have by far the best design, a superior base to build from. While the competition adds new "modes" for every feature, we have a pure, consistent and expandable design. While the competition forces you to accept their particular philosophy, we offer maximized flexability. If you already have a debugger or are looking for your first, look no further because you can't do any better. We invite you to compare our debugger, DSD86, with any other on the market.

- Recursive Command Macros & Files
- Bind Macros to any key
- Multi-segment Symbol Support
- Symbolic Register & Stack Displays
- User Customizeable Screen Layout
- Superior Mode-less Design
- Source Window for MS Languages
- User Writable Commands & Displays
- Fast Screen Update
- Unique Breakpointing Facilities
- 30 Day Money Back Guarantee

Call or write for our free report on truly advanced debugging technology which explains DSD86's design and why it is superior to the debugger you are currently using.

Take the DSD challenge: secure a money back guarantee with any of our competitors. Buy both debuggers and use them for a month. Send the one you like least back for a refund.

Only $69.95!

Soft Advances
P.O. Box 49473
Austin, Texas 78765
512-478-4763
"Programming for Productivity and Profit"
Please include $4 shipping

Circle **no. 83** on reader service card.

ATTENTION!

DDT, SID and ZSID USERS!

Why are you wasting your time with outdated debugging tools when you could be using DSD80 by Soft Advances?

DSD80 is unmatched in the CP/M-80 world and even makes most 16 bit PC programmers green with envy.

- Full Screen Display
- DDT Command Compatibility
- Software In-Circuit Emulator
- Superior Symbol Support
- Intel and Zilog Mnemonics
- 8080 and Z80 Support
- Single Step Subroutines
- ASCII and Binary String Searching
- Port Input and Output
- View Disk Files
- Uses only 16k of TPA
- Stack Display
- Highlighted Memory Display
- Dual Monitor Support
- User Writeable Display
- 30 Day Money Back Guarantee

You can experience the power of DSD80 for only $125. Our money back guarantee will protect you from overloads.

Soft Advances
P.O. Box 49473
Austin, Texas 78765
512-478-4763
"Programming for Productivity and Profit"

Please include $4 for shipping. DSD is a trademark of Soft Advances; CP/M, SID & ZSID are trademarks of Digital Research. Dealer inquires invited. Ask us about DSD86 for the IBM PC.

Circle **no. 111** on reader service card.

Ram Disk Listing (Listing continued, text begins on page 84)

```
231A:43 4C 45 41            ASC    'CLEAR          DIRECTORY "Y" OR "N"'
2334:8D 8D                  DFB    CR,CR
2336:20 20 20 20            ASC    '
234A:00                     DFB    EOL
234B:              *
234B:              * ABORT MESSAGE
234B:              *
234B:8D 8D 8D 8D   ABORTMSG DFB    CR,CR,CR,CR
234F:8D 8D 8D 8D            DFB    CR,CR,CR,CR
2353:20 20 20 20            ASC    '
2357:44 45 56 49            ASC    'DEVICE         DRIVER ALREADY INSTALLED'
2376:8D 8D                  DFB    CR,CR
2378:20 20 20 20            ASC    '
2385:50 52 4F 47            ASC    'PROGRAM        ABORT'
2392:8D 8D 8D 8D            DFB    CR,CR,CR,CR
2396:00                     DFB    EOL
2397:              *
2397:              ******************************
2397:              *
2397:              * THIS ROUTINE IS USED TO ASK
2397:              * THE USER WHERE HE/SHE WOULD
2397:              * LIKE TO MOVE THE RAMDISK
2397:              * DRIVER CODE TO. THERE ARE
2397:              * THREE LOCATIONS TO MOVE THE
2397:              * CODE TO OR THE USER CAN QUIT
2397:              *
2397:              * LOC 1: INSIDE PRODOS AT $F000
2397:              * LOC 2: BETWEEN THE BASIC
2397:              *        INTERPRETER AND THE
2397:              *        FILE BUFFERS.
2397:              * LOC 3: AT $300
2397:              *
2397:20 58 FC      WHERETO: JSR    HOME
239A:A0 00                  LDY    #0
239C:B9 0F 24      WT0      LDA    WHEREMSG,Y
239F:C9 00                  CMP    #EOL
23A1:F0 09    23AC          BEQ    WT1
23A3:              *
23A3:09 80                  ORA    #$80
23A5:20 ED FD               JSR    COUT
23A8:C8                     INY
23A9:4C 9C 23               JMP    WT0
23AC:              *
23AC:20 3A FF      WT1      JSR    BELL
23AF:20 41 25               JSR    GETKEY
23B2:C9 31                  CMP    #'1'
23B4:F0 15    23CB          BEQ    WT2
23B6:              *
23B6:C9 32                  CMP    #'2'
23B8:F0 20    23DA          BEQ    WT3
23BA:              *
23BA:C9 33                  CMP    #'3'
23BC:F0 2A    23E8          BEQ    WT4
23BE:              *
```

(Continued on page 94)

¿C? ¡Sí!

If you're a C programmer (or want to be one), we speak your language. Subscribe to **The C Journal** today, and start increasing your productivity right away. We give you information you can **use** on **any** machine — IBM PC™, UNIX™-based, Macintosh™, or CP/M™ — micro, mini, or mainframe.

- in-depth reviews and feature articles — C compilers, editors, interpreters, function libraries, and books.
- hints and tips — help you work **better** and **faster**.
- interviews — with software entrepreneurs that **made it** — by using C.
- news and rumors — from the ANSI standards committee and the industry.

Limited Time Offer

Join our thousands of subscribers at the **Discount Rate** of only $18 for a full year (regularly $28)! Call us now at (201) 989-0570 for faster service — don't miss a single issue of **The C Journal!**

Please add $9 for overseas airmail.

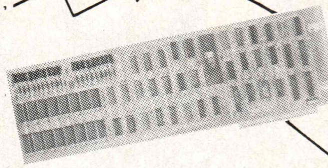
Trademarks — CP/M: Digital Research Inc. IBM PC: IBM Corp. Macintosh: Apple Computer Corp. **The C Journal:** InfoPro Systems. UNIX: AT&T Bell Labs.

InfoPro Systems
3108 Route 10
Denville, NJ 07834
(201) 989-0570

MasterCard VISA

Circle no. **75** on reader service card.

Decmation's
BLUE LIGHTNIN'
PC Z80 CO-PROCESSOR
CP/M* EMULATOR



The *Blue Lightnin'* blows the competition away with its 9 MHZ clock speed, 128K byte memory and optimized I/O.

With the *Blue Lightnin'* your PC or AT compatible can run CP/M-80 software, or optionally, Intel development system software (ISIS). We include a debugger and a quality Z80 assembler and linker. You also get an Xmodem-compatible serial communications program, in both CP/M and MS-DOS versions. A version for Intel development systems is also available.

We have plug-in cards for VAX** and PDP-11** to run CP/M-80 or MS-DOS software.

The ideal tool for microprocessor software development or any CP/M application.

The *Blue Lightnin'* is distributed by:
TSI 1897 Garden Ave., Eugene, OR 97403
1-800-874-2288

The *Blue Lightnin'* is manufactured by:
(408) 980-1678
Decmation
Telex 171596
AAA COM SUVL
2065 Martin Avenue, # 110 Santa Clara, California 95050

*CP/M is a registered trademark of Digital Research, Inc.
**VAX and PDP-11 are trademarks of the Digital Equipment Corporation, with whom Demation is not connected.

Circle no. **162** on reader service card.

MacTutor™

The Macintosh Programming Journal

"...the anticipation of finally being able to associate myself with a first rate tech journal leaves me almost 'codeless'!" -R. Onzo

"Ah! Eureka! This is the publication that I've been looking for. It's not too glossy, slick or condescending. It's meat, fact, it's wonderful!" - Rick Barrett

The number one technical journal for Macintosh software development in C, assembly, Pascal, Basic, Forth, with NEON, Modula-2, APL and Lisp. $24 per year US, $30 for Canada and $36 overseas. Find out why we're number 1 today!

Sample: (714) 579-7700
P.O. Box 846, Placentia, CA. 92670

Circle **no. 68** on reader service card.

ST-FORTH $49

For your IBM PC/XT/AT/PCjr

A complete FORTH development system for beginners or experienced users

- 100% FORTH-83 Standard
- ALL source code provided
  Written entirely in FORTH & FORTH assembler
- Powerful, fast, easy-to-use editor
  Search, locate source, edit errors
- Extensive MS-DOS/PC-DOS interface
  Sequential & random files
- Many more useful utilities
- Supplied as MS-DOS .COM file
  Compatible with all versions of DOS
- 148-page User's Manual
- Unconditional money-back guarantee

Beginner's pkg based on Leo Brodie's *Starting FORTH* available

Call or write for brochure and order form.

Sunset Technology
1954 Menalto Ave.
Menlo Park, CA 94025
(415) 325-3680

Circle **no. 144** on reader service card.

RUN CP/M 80 ON IBM FAST!

Now your IBM PC or compatible can access the vast library of CPM/80-2.2 software titles, and run them at lightning speed! Our revolutionary MICRUN/CPM non-emulating interface executes CP/M software on PC's by utilizing the power of NEC's newest microprocessor, the V-20. The V-20/30 chip replaces your PC resident 8088 or 8086 microprocessor chip, thereby providing 8 bit processing ability and actually improving it's 16 bit performance by up to 50%. If your PC is not already equipped with the NEC V-20 there is no problem. Simply purchase our MICRUN/CPM software package, and we will provide you with the V-20 chip for only $45 dollars.

Features

- Incredibly fast-up to 8 MHz
- Ability to run CPM programs in color
- Cross sub-directory operations
- No expensive co-processor board req.
- Not an emulator
- Includes disk transfer utility for reading, writing, and formatting up to 70 different CP/M and MS-DOS disks.
- 16 logical/physical drives
- Includes RS232 communications program for transferring software to or from CPM system to PC.

Supports

Osborne*Kaypro*Zenith H-19*Televideo*Radio Shack*ADM3A*VT-52*
Visual 210 adds Viewpoint*Hazeltine Espirit & 1510* Plus many more

ONLY $99.95

Included in the above price: Interface software, disk transfer utility program, RS232 communications program, complete documentation. Not included is the NEC V-20 microprocessor chip which is available at a price of only $45 dollars.

MasterCard **1-800-637-7226** VISA

Orders only.

mic

Micro Interfaces Corporation
6824 N.W. 169th Street
Hialeah, Florida 33015
(305) 823-8088

Dealer Inquiries Invited

Trademarks: CP/M (Digital Research, Inc.), IBM (IBM Corp.).

Circle **no. 110** on reader service card.

d/MULTI

MULTIUSER dBASE for TurboDOS

TRUE File and Record Locking as easy as d-BASE-II. Unlimited users can perform the magic of dBASE in the program or interactive mode

* TurboDOS 1.3 or 1.4
* No Peeks or Pokes
* System Date and Time Functions
* Printspooler Controls up to 16 printers

Martian Technologies . . .
.CREATEing Multi-users from Single-users around the world

CALL FOR DETAILS

Martian Technologies
8348 Center Dr., Ste.-F, La Mesa, CA 92041
(619) 464-2924

Circle **no. 70** on reader service card.

Ram Disk Listing (Listing continued, text begins on page 84)

```
23BE:C9 51              CMP   #'Q'
23C0:D0 EA    23AC      BNE   WT1
23C2:               *
23C2:20 58 FC           JSR   HOME
23C5:20 3A FF           JSR   BELL
23C8:4C 00 BE           JMP   WARMDOS
23CB:               *
23CB:               * MOVE CODE INSIDE PRODOS
23CB:               *
23CB:A9 00          WT2 LDA   #$00
23CD:85 02              STA   SSDCODE
23CF:A9 FF              LDA   #$FF
23D1:85 03              STA   SSDCODE+1
23D3:AD 81 C0           LDA   $C081
23D6:AD 81 C0           LDA   $C081
23D9:60                 RTS
23DA:               *
23DA:               * MOVE CODE UNDER BI
23DA:               *
23DA:A9 01          WT3 LDA   #1
23DC:20 F5 BE           JSR   GETBUFF
23DF:B0 10    23F1      BCS   BUFFERROR
23E1:               *
23E1:85 03              STA   SSDCODE+1
23E3:A9 00              LDA   #$00
23E5:85 02              STA   SSDCODE
23E7:60                 RTS
23E8.               *
23E8:               * MOVE CODE TO $300
23E8:               *
23E8:A9 00          WT4 LDA   #$00
23EA:85 02              STA   SSDCODE
23EC:A9 03              LDA   #$03
23EE:85 03              STA   SSDCODE+1
23F0:60                 RTS
23F1:               *
23F1:               * ERROR GETTING BUFFER FROM SYS
23F1:               *
23F1:20 3A FF       BUFFERROR JSR BELL
23F4:20 58 FC           JSR   HOME
23F7:A0 00              LDY   #0
23F9:B9 B3 24       BE0 LDA   NOBUFF,Y
23FC:C9 00              CMP   #EOL
23FE:F0 09    2409      BEQ   BE1
2400:               *
2400:09 80              ORA   #$80
2402:20 ED FD           JSR   COUT
2405:C8                 INY
2406:4C F9 23           JMP   BE0
2409:               *
2409:20 3A FF       BE1 JSR   BELL
240C:4C 00 BE           JMP   WARMDOS
240F:               *
240F:               ********************************
```

(Continued on page 96)

SOURCE INCLUDED

The **LIBRARIAN** Inc.

has taken the drudgery out of generating plots. These libraries contain the most complete collection of plotting subroutines you can buy. Each collection places over 40 routines (in FORTRAN or C language*) at your fingertips. The library makes it easy to:

- **plot semi-log and log-log graphs**
- **draw arcs and circles**
- **scale charts to exact sizes**
- **label text in different sizes, directions, and orientations**
- **design bar charts and pie charts**
- **and much more**

Each package includes source code and a comprehensive manual.

Operating Systems: **MS-DOS and PC-DOS**

Plotters Supported: **Houston Instruments**
Hewlett-Packard
HPGL compatibles

We are constantly testing our libraries on different computers and with different compliers including: Microsoft FORTRAN, DR FORTRAN-77, RM FORTRAN, Lahey F77L, CI-C86™, and MWC 86. Specify compiler when ordering.

Price: **$295.00**

For More Information: **The Librarian, Inc.**
10435 Greenbough, #110
Stafford, TX 77477
(713) 499-7662 or 491-2088

**We're developing libraries in BASIC and Pascal, too!*

Circle **no. 117** on reader service card.

The Best ProDOS Assembler In The World *ORCA/M*™

Who says so?

Among others, *Peelings //* magazine! When they did a comparative study of Apple // assemblers, here's how they rated them:

ORCA/M	AAA
Merlin	A+
S-C Macro Assembler	A+
The Assembler (Micro Sparc)	A
Lisa 2.5	B+
EdASM	B

ORCA/M 4.0

is also the only assembler to fully support the new 65816 CPU - earning it the endorsement of the Western Design Center, designers of the 65C02, 65802 and 65816!

ORCA/M 4.0 is a complete development environment for assembly language programming for ProDOS. The system includes the Assembler with full macro capabilities, Link Editor, Command Processor, Full Screen Text Editor, Disassembler, many utilities, Macro and Subroutine Libraries, (2, 4 and 8 byte integer mathematics and full graphics libraries, including double hi-res) and 6502, 65C02, 65802 and 65816 support! **$79.95**

Small-C Compiler

All full C language statements are supported, along with most operators and short and long integers. Supports P-code for space efficiency and native code for speed. Complete source code for the compiler is included. (Requires ORCA/M 4.0) **$39.95**

Support Programs

MON+ - A powerful Symbolic Debugger with disassembler, mini-assembler, step and trace, and much more for debugging assembly language programs. **$29.95**

ORCA O/S Source - Includes the source code for the ORCA/M operating system, subroutine libraries and XREF (global cross reference) utility. **$39.95**

Floating Point Libraries - Supports IEEE single and double precision floating point formats. Includes transcendental functions and complete source code. **$39.95**

The Byte Works Inc.
8000 Wagon Mound Dr. NW
Albuquerque, NM 87120
(505) 898-8183

New Mexico residents add 4.375%
Free shipping in U.S. and Canada

Circle **no. 177** on reader service card.

Circle **no. 84** on reader service card.

UNIX/XENIX COMPATIBILITY!

C·lib™

C FUNCTION LIBRARY

C-LIB incorporates over 200 routines to extend the capabilities of C on the IBM PC. Versions are available for the Lattice, Microsoft, and DeSmet (C Ware) C compilers. All libraries are compatible with PC-DOS 2.0+ operating systems.

Featuring:

- UNIX-Compatible "CURSES" Screen/Window Processing Library
- Buffered, Interrupt-driven, Asynchronous Communications Library
- Powerful String Functions
- 8087/Microsoft Floating Point Conversion

C-LIB SOFTWARE AND MANUAL PACKAGE $195.

Please call or write for additional information.
DEMO DISKETTE AVAILABLE, please include $5.

VANCE info systems

2818 clay street • san francisco, ca 94115 • (415) 922-6539

IBM & PC-DOS are trademarks of International Business Machines Corp. Lattice is a trademark of Lattice Inc. Xenix & Microsoft C are trademarks of Microsoft Inc. UNIX is a trademark of Bell Labs. C-LIB is a trademark of VANCE info systems.

Circle **no. 154** on reader service card.

SERIOUS SOFTWARE
FOR
SERIOUS DEVELOPERS

FABS PLUS

(B-Tree Structure) Rapid access and maintenance of very large files with millions of records. Extremely fast on unlimited number of keys. Index utility provides protection from corrupted index files. Can be used on files as large as your system can hold.

RETAIL PRICE $195.00

Network versions of FABS PLUS also available for PC-DOS 3.XX and Novell Netware.

RETAIL PRICE $395.00

AUTOSORT

Sort/Merge subsystem for very large files. In stand-alone or callable sub-routine, extremely fast. Sorts files as large as the operating system and workspace will allow.

RETAIL PRICE $150.00

Versions available for FABS and AUTOSORT:
CPM-80, CP/M-86, MP/M-11, MS-DOS, PC-DOS, MICROSOFT BASIC(S), COBOL, FORTRAN, PASCAL, PL/1, CBASIC, CB80, CB86, CBASIC86, LATTICE C

DB-FABS

Data, Screen, Report Manager: Can be used in stand-alone and run-time modes. Creates files and forms for the management and access of data. Report and screen handler to generate listings. B-Tree indexing and high speed sort capabilities.

RETAIL PRICE $295.00

Version of DB-FABS available for Novell Netware

RETAIL PRICE $395.00

COMPUTER CONTROL SYSTEMS, INC.
ROUTE 3, BOX 168, LAKE CITY, FL 32055 (904) 752-0912

Circle **no. 127** on reader service card.

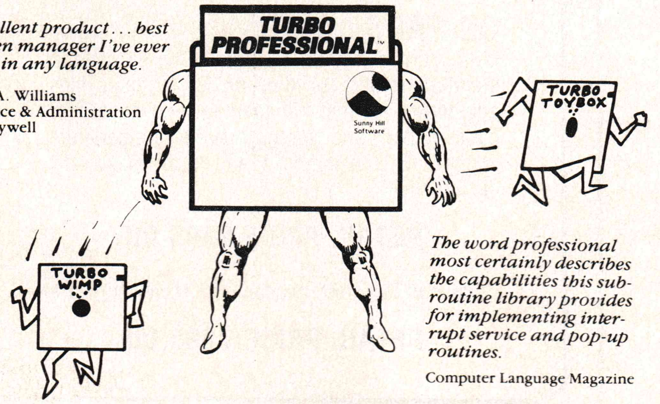
```
240F:                *
240F:                * MESSAGE ASKING USER WHERE
240F:                * TO PUT RAMDISK DRIVER CODE.
240F:                *
240F:8D 8D 8D 8D     WHEREMSC  DFB   CR,CR,CR,CR
2413:20 20 20 20               ASC   '
2418:52 41 4D 44               ASC   'RAMDISK        DRIVER ADDRESS
242F:4F 50 54 49               ASC   'OPTIONS'
2436:8D 8D 8D                  DFB   CR,CR,CR
2439:20 20 20 20               ASC   '
243F:5B 31 5D 20               ASC   '[1]            INSIDE PRODOS AT $FF00'
2459:8D 8D                     DFB   CR,CR
245B:20 20 20 20               ASC   '
2461:5B 32 5D 20               ASC   '[2]            UNDER BASIC INTERPRETER'
247C:8D 8D                     DFB   CR,CR
247E:20 20 20 20               ASC   '
2484:5B 33 5D 20               ASC   '[3]            AT $300'
248F:8D 8D                     DFB   CR,CR
2491:20 20 20 20               ASC   '
2497:5B 51 5D 55               ASC   '[Q]UIT'
249D:8D 8D                     DFB   CR,CR
249F:20 20 20 20               ASC   '
24A9:20 20 20 20               ASC   '
24B2:00                        DFB   EOL
24B3:                *
24B3:                *******************************
24B3:                *
24B3:                * NO DOS BUFFER FOUND UNDER BI
24B3:                *
24B3:8D 8D 8D 8D     NOBUFF    DFB   CR,CR,CR,CR
24B7:8D 8D 8D 8D               DFB   CR,CR,CR,CR
24BB:20 20 20 20               ASC   '
24C9:46 41 54 41               ASC   'FATAL          ERROR'
24D4:8D 8D                     DFB   CR,CR
24D6:20 20 20                  ASC   '                  '
24D9:43 4F 55 4C               ASC   'COULD          NOT ALLOCATE BUFFER BETWEEN
'
24FA:8D 8D                     DFB   CR,CR
24FC:20 20 20 20               ASC   '                       '
2506:42 49 20 41               ASC   'BI             AND FILE BUFFERS'
2519:8D 8D                     DFB   CR,CR
251B:20 20 20 20               ASC   '                 '
2520:46 4C 41 53               ASC   'FLASHCARD      DRIVER NOT INSTALLED'
253E:8D 8D                     DFB   CR,CR
2540:00                        DFB   EOL
2541:                *
2541:                *******************************
2541:                *
2541:                * THIS ROUTINE IS USED TO GET
2541:                * A SINGLE KEYPRESS FROM THE
2541:                * KEYBOARD AND RETURN IT IN
2541:                * THE A-REG WITH THE MSB OFF.
2541:                *
2541:8D 10 C0        GETKEY    STA   STROBE
2544:AD 00 C0        GK1       LDA   KEY
2547:10 FB    2544             BPL   GK1
2549:8D 10 C0                  STA   STROBE
254C:29 7F                     AND   #$7F
254E:60                        RTS
254F:                *
254F:                *******************************
254F:                *
254F:                * PRINT PROGRAM TITLE
254F:                *
254F:20 58 FC        TITLE     JSR   HOME
2552:A0 00                     LDY   #0
2554:B9 9B 25        TI1       LDA   MSG,Y
2557:C9 00                     CMP   #EOL
2559:F0 08    2563             BEQ   TI2
255B:                *
255B:09 80                     ORA   #$80
255D:20 ED FD                  JSR   COUT
2560:C8                        INY
2561:D0 F1    2554             BNE   TI1
2563:60              TI2       RTS
2564:                *
2564:                *******************************
2564:                *
2564:                * THIS ROUTINE WILL DISPLAY THE
2564:                * RAM DISK VOLUMN NAME IF THE
```

(Continued on page 98)

ATTENTION TURBO PASCAL PROGRAMMERS

Excellent product . . . best screen manager I've ever seen in any language.

Don A. Williams
Finance & Administration
Honeywell



The word professional most certainly describes the capabilities this subroutine library provides for implementing interrupt service and pop-up routines.

Computer Language Magazine

Get the tools that have no competition.

TURBO PROFESSIONAL's easy to use routines let you . . . write safe, "sidekickable" routines that can use DOS • execute DOS commands from Turbo • create super-fast windowed displays • service interrupts without assembler • make your own keyboard enhancers • allocate memory from DOS • print concurrently with DOS 3.x.

Complete with 109 + routines, manual, source code to Super Macs keyboard enhancer, and many example programs.

Only $49.95 + $5.00 shipping & handling

Visa, MasterCard ok.

Order now!
(206) 367-0650

Sunny Hill Software
13732 Midvale North Suite 206
Seattle, Washington 98133

Requires Turbo for compatibles. Turbo Pascal & Sidekick Trademark Borland Intl.

Circle **no. 172** on reader service card.

PCTeX Now for PC Users:

Professional Typesetting Capability

PCTeX brings to the personal computer user the ability to put any kind of information on paper in a professional, elegant manner. It brings the full power and flexibility of TeX implementations on mainframes to owners of IBM PC's, AT's and workalike computers.

PCTeX is widely used for formatting technical and mathematical material. It is also perfectly suited for producing professional-quality reports, manuals, even books.

PCTeX offers a wide range of typefaces, and a wide choice of drivers which output the finished material on dot matrix printers (Epson, Toshiba), low-cost laser printers (Apple LaserWriter, Corona LP300) and graphics screen preview (Hercules, EGA). All text in this ad has been formatted by PCTeX and produced on a Corona Laser Printer.

Join hundreds of satisfied PCTeX users. Write or call us today.

PCTeX: only $279. Dot-matrix drivers: $100. Laser drivers: $300. Preview (Hercules GC): $250. MF Medley (44 fonts, including Computer Helvetica): $100. Corona Laser Printer and PCTeX: complete $3395. System requirements: DOS 2.0 or later, 512K RAM, 10M hard disk. M/C, Visa accepted.

Personal TeX Inc

20 Sunnyside, Suite H
Mill Valley, CA 94941
(415) 388-8853 Telex 275611

Trademarks: PCTeX, Personal TeX, Inc.; TeX, American Mathematical Society; IBM PC and AT, IBM Corp; LaserWriter, Apple Computer, Inc.; Hercules Graphics Card, Hercules Computer Technology.

Circle **no. 76** on reader service card.

THE BEST Z80 ASSEMBLER ON THE MARKET JUST GOT BETTER!

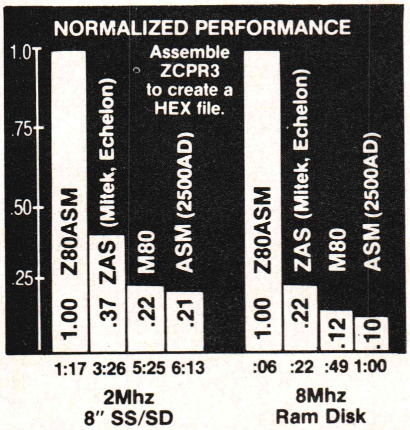
Z80ASM

NOW ONLY $49.95

DON'T ASK HOW OURS CAN BE SO FAST . . . ASK WHY THEIRS ARE SO SLOW!

". . a breath of fresh air . ."
Computer Language, Feb. 85

". . in two words, I'd say speed & flexibility",
Edward Joyce, User's Guide #15



Now fully compatible with M80 in .Z80 mode with many extensions. Time & date in listing, 16 char. externals, plus many other features.

To order, or to find out more about our complete family of development tools, call or write:

SLR Systems

1622 N. Main St., Butler, PA 16001
(800) 833-3061, (412) 282-0864
Telex 559215 SLR SYS

C.O.D., Check or Money Order Accepted

SHIPPING: USA/CANADA + $3 • OTHER AREAS + $10
Z80 CP/M compatibility required.

Circle **no. 78** on reader service card.

$49.95 **FMT** **$49.95**

Text Formatting System

FMT provides most of the features of the high-priced Text Formatters at our inexpensive price -- and it's easier to use, too! Note the features below:

- Easily configured to your printer. Configuration files for 20+ printer models are provided or generate your own.
- FMT gets the most from your printers by taking advantage of their special features, including condensed, double width, enhanced, double print, italics, elite, letter quality, multiple fonts, etc.
- Multiple modes and combinations of modes can be used on the same line or even in the same word.
- FMT works with your favorite editor!
- FMT uses meaningful mneumonic commands in the style of SCRIPT or ROFF (each command appears on its own input line), including commands for the various printing modes.
- No embedded control codes - you don't have to remember those strange escape/control sequences.
- FMT runs at the maximum speed your printer allows for each printing mode - graphics mode is not required.
- Standard formatting features provided, including headers and footers, automatic page numbering, text justification, tabs for table generation, and embedded files up to TEN deep.
- FMT automatically builds Table of Contents, List of Figures, and three level alphabetized Index.
- Detailed 100+ page manual profusely illustrated with examples.
- Works equally well with IBM-PC, TI-PC, IBM clones and look-alikes (PC-DOS/MS-DOS 128k). Also works with CP/M 8080 and Z80 systems with 64k.
- $49.95 plus $2.00 shipping and handling.

Specify system.

VISA and Master Card Accepted

Dealer Inquiries Welcome

TINY TEK, INC.
Route 1, Box 795
Quinlan, Texas 75474
(214) 447-3025

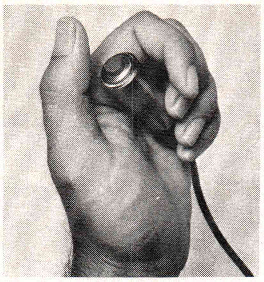
Circle **no. 119** on reader service card.

 (Listing continued, text begins on page 84)

```
2564:                * INSTALL WAS SUCCESSFULL.
2564:                *
2564:A0 00           DISPVOL   LDY   #0
2566:B9 31 26        DV0       LDA   VOLNAME,Y
2569:C9 00                     CMP   #EOL
256B:F0 09    2576             BEQ   DV1
256D:09 80                     ORA   #$80
256F:20 ED FD                  JSR   COUT
2572:C8                        INY
2573:4C 66 25                  JMP   DV0
2576:                *
2576:A0 00           DV1       LDY   #0
2578:B9 5C 26        DV2       LDA   VOLUME,Y
257B:C9 00                     CMP   #EOL
257D:F0 0C    258B             BEQ   DV3
257F:C0 0E                     CPY   #14
2581:F0 08    258B             BEQ   DV3
2583:                *
2583:09 80                     ORA   #$80
2585:20 ED FD                  JSR   COUT
2588:C8                        INY
2589:D0 ED    2578             BNE   DV2
258B:                *
258B:20 8E FD        DV3       JSR   CROUT
258E:20 8E FD                  JSR   CROUT
2591:20 8E FD                  JSR   CROUT
2594:20 8E FD                  JSR   CROUT
2597:20 3A FF                  JSR   BELL
259A:60                        RTS
259B:                *
259B:                ********************************
259B:                *
259B:                * PROGRAM TITLE
259B:                *
259B:8D 8D 8D        MSG       DFB   CR,CR,CR
259E:8D 8D 8D                  DFB   CR,CR,CR
25A1:20 20 20 20               ASC   '                '
25AA:50 52 4F 44               ASC   'PRODOS          RAMDISK DRIVER'
25BF:8D 8D                     DFB   CR,CR
25C1:20 20 20 20               ASC   '                '
25CE:46 4F 52 20               ASC   'FOR             FLASHCARD'
25DB:8D 8D                     DFB   CR,CR
25DD:20 20 20 20               ASC   '                '
25EB:56 45 52 53               ASC   'VERSION         1.3'
25F6:8D 8D                     DFB   CR,CR
25F8:20 20 20 20               ASC   '                '
2605:41 4C 46 52               ASC   'ALFRED          STEELE'
2612:8D 8D                     DFB   CR,CR
2614:20 20 20 20               ASC   '                '
2623:4A 55 4C 59               ASC   'JULY            1985'
262C:8D 8D 8D 8D               DFB   CR,CR,CR,CR
2630:00                        DFB   EOL
2631:                *
2631:                *
2631:                *
2631:20 20 20 52     VOLNAME   ASC   '                RAMDISK VOLUME NAME /'
2649:00                        DFB   EOL
264A:                *
264A:                ********************************
264A:                *
264A:                * CLEAR DIRECTORY FLAG
264A:                * SET FLAG FOR NO CLEAR
264A:                *
264A:01              CLEARDIR  DB    $01
264B:                *
264B:                ********************************
264B:                *
264B:                * MLI WRITE PARAMETER LIST
264B:                *
264B:03              MLIWRITE  DB    $03
264C:50                        DB    $50
264D:57 26                     DW    BUFFER
264F:02 00           WRITEBLOCK DW   $0002
2651:                *
2651:                ********************************
2651:                *
2651:                * MLI READ PARAMETER LIST
2651:                *
2651:03              MLIREAD   DB    $03
2652:50                        DB    $50
2653:00 20           READBUFF  DW    $2000
2655:02 00           READBLOCK DW    $0002
2657:                *
2657:                ********************************
2657:                *
2657:                * MLI READ BUFFER
2657:                *
2657:                * THE BYTES FROM BUFFER TO
2657:                * MIDBUFF IS THE RAMDISK VOLUME
2657:                * DIRECTORY HEADER. THESE BYTES
2657:                * HAVE TO BE WRITTEN TO THE
2657:                * RAMDISK AT BLOCK 2 BEFORE THE
2657:                * RAMDISK CAN BE USED BY PRODOS
2657:                *
2657:                * WE WILL ALSO USE PARTS OF
2657:                * THIS VOLUME DIRECTORY HEADER
2657:                * AS A CHECK TO SEE IF THE
2657:                * RAMDISK IS ALREADY FORMATTED
2657:                * IF SO THE USER CAN REFORMAT
2657:                * THE RAMDISK OR LEAVE IT ALONE
2657:                *
2657:00 00           BUFFER    DB    $00,$00
2659:                * LAST BLOCK
2659:03 00                     DB    $03,$00
265B:                * STORAGE TYPE/NAME LENGTH
265B:F3                        DB    $F3
265C:                * VOLUME NAME
265C:52 41 4D        VOLUME    ASC   'RAM'
265F:00 00 00 00               DB    $00,$00,$00,$00
2663:00 00 00 00               DB    $00,$00,$00,$00
2667:00 00 00 00               DB    $00,$00,$00,$00
266B:                * RESERVED
266B:00 00 00 00               DB    $00,$00,$00,$00
266F:00 00 00 00               DB    $00,$00,$00,$00
2673:                * CREATION DATE/TIME
2673:00 00 00 00               DB    $00,$00,$00,$00
2677:                * VERSION/MIN VERSION
2677:00 00                     DB    $00,$00
2679:                * ACCESS BYTE
2679:43                        DB    $43
267A:                * ENTERY LENGTH
267A:27                        DB    $27
267B:                * ENTERIES PER BLOCK
267B:0D                        DB    $0D
267C:                * FILE COUNT ON DISK
267C:00 00                     DW    $0000
267E:                * BLOCK NUMBER OF BIT MAP
267E:06 00                     DW    $0006
2680:                * TOTAL NUMBER BLOCKS ON DISK
2680:00 02                     DW    $0200
```

(Continued on page 100)

Introducing Periscope II Professional Debugger and Break-out Switch



New Periscope II includes a remote break-out switch that does not need its own slot!

(Periscope is) "the best value in development tools currently on the market . . . the most essential element of my 'developer's toolbox'." —Jeff Garbers

"Very powerful for debugging and testing . . . Better than Atron by far." —Wynn Bailey

The break-out switch ***"really sets Periscope apart from the typical software-only debuggers."*** Hung system or locked keyboard? Press the switch to get control!

Periscope's symbol support ***"beats the daylights out of snooping through a map file and making notes".*** See high-level line numbers and source code, too!

"Feel right at home" **in no time** with commands that logically extend Debug's!

Periscope's speed makes other debuggers ***"look absolutely sluggish"!*** It's written entirely in assembler and uses DOS only for file access.

Has all the standard features plus:
- Debug with over 75 breakpoint options
- **New!** Write your own breakpoint tests
- **New!** Traceback
- **New!** Do in-line symbolic assembly
- Debug using one or two monitors
- Recall command lines
- **New!** Debug with high-level source code
- **New!** Redefine windows while debugging
- **New!** View text files while debugging
- Debug device drivers, non-DOS and memory-resident programs
- **New!** Customize Periscope via user exits
- **New!** Display 8087/80287 status
- **New!** Use Periscope with an EGA

Periscope requires: IBM PC, XT, AT, or close compatible; DOS 2.0 & later; 128K RAM; 1 Disk Drive; 80-column Monitor.

Periscope II, break-out switch, manual, reference card and software . . . $145!

Periscope I also includes the write-protected RAM board to protect crucial debugger code. It's just $295!

The US Navy gets Periscopes from us . . . shouldn't you? Order today!

Order/Information Call Toll-Free:

800-722-7006

30-Day Money-Back Guarantee

Data Base Decisions • 404/256-3860
14 Bonnie Lane • Atlanta, GA 30328

Circle no. **130** on reader service card.

NEW! ZBasic:

Finally, the simplicity of BASIC, yet faster than Turbo.

· Works the same on all micros
· Uses same commands—regardless of computer make
· Structured Basic— (spaghetti optional)
· Device-independent graphics (same graphic commands on all computers)
· 6 – 54 digits of precision (selectable by user)
· Built-in interactive editor and compiler—to compile and execute, just type "run."
· Choice of alphanumerics labels or line numbers
· Chaining with shared variables

Not Copy Protected—No Run Time Fees or Royalties
One low price—No Hidden Costs. Only $89.95 complete!

•=YES	ZBasic Interpiler 3.0	TURBO PASCAL 3.0	MBASIC compiler	True BASIC	BASICA Interpreter (IBM PC)
IBM and compatibles	•	•	•	•	•
Apple //e, //c (6502)	•	Not Avail.	Not Avail.	Not Avail.	Not Avail.
Macintosh	4th Qtr.	Not Avail.	Not Avail.	Not Avail.	Not Avail.
CP/M-80 2.2, 3.0	•	•	•	Not Avail.	Not Avail.
TRS-80 Mod I, III, 4, 4p	•	Not Avail.	•	Not Avail.	Not Avail.
Direct commands	•	Not Avail.	Not Avail.	•	•
Maximum scientific digits of accuracy. (COS, SIN, ATN, LOG, EXP etc.)	6 to 54 selectable by the user	11 Binary BCD Not Avail.	16	16	6
Device Ind. Graphics (same commands all graphic modes and computers)	•	Not Avail.	Not Avail.	Not Avail.	Not Avail.
SAME File commands all computers?	•	Not Avail.	Not Avail.	Not Avail.	Not Avail.
STRUCTURED: Labels, Functions, LONG IF etc.	•	•	Not Avail.	•	Not Avail.
Same editor commands all versions/computers	•	•	Not Avail.	Not Avail.	Not Avail.
Sieve benchmark (Byte January 1983, 10 iter's)	13.7 sec.	14.1 sec.	14.9 sec.	261 sec.	2190 sec.
Shell-Metzner SORT (Sybex-BASIC for Scientist's and Eng. 2,000 5 char. strings)	19 sec.	28 sec.	71 sec.	194 sec.	2700 sec.
Executable Machine Lang. & approx. File size	12k	12k	32k	Not Avail.	Not Avail.
PRICE with BCD BCD=No rounding errors)	89.95	109.95	450.00	Not Avail.	Not Avail.
PRICE without BCD	89.95 BCD FREE	69.95	395.95	149.95	Comes with computer

Zbasic is a trademark of ZEDCOR, Inc © 1985 IBM is a registered trademark of International Business Machines Corp. Apple //e, //c are trademarks of Apple Comp. Inc. Macintosh is a trademark licensed to Apple Comp. Inc. PM-80 is a registered trademark of Digital Research Inc. TRS-80 is a registered trademark of the Tandy Corp. TURBOPASCAL is a registered trademark of Borland Int. MBASIC is a registered trademark of Microsoft Corp. True BASIC is a registered trademark of Addison-Wesley Publishing Co. BASICA is a registered trademark of International Business Machines Corp. All benchmarks and accuracies apply to standard IBM PC with 8088. Other computers and/or CPU benchmark speeds, accuracies and object code file sizes will vary depending on the computer clock speed, operating systems and other factors beyond our control.

ZBasic™

The lightening-fast BASIC from Zedcor

To order use this coupon or call (orders only): 1-800-482-4567
INQUIRIES: (602) 795-3996

(Name)

(Address) (Apt.)

(City) (State) (Zip)

(Day Phone)

CREDIT CARD—MASTERCARD/VISA/AMEX/C.O.D.

CREDIT CARD EXPIRATION DATE:

Mail to:
ZEDCOR INC
4500 E. Speedway, Ste. 93
Tucson, AZ 85712

$89.95 for each version

- ☐ IBM PC & Compatibles
- ☐ Apple //c, //e
- ☐ CPM-80
- ☐ KAYPRO Graphics
- ☐ TRS-80 (Model 1,3)
- ☐ TRS-80 (Model 4)
- ☐ Macintosh (4th QTR '85)
- ☐ DEVELOPERS—BUY ALL 6—$399.75, ($449.75 VALUE) SAVE $140.00

U.S. shipping $5.00 per order ($10.00 C.O.D.) $ ______

TOTAL $ ______

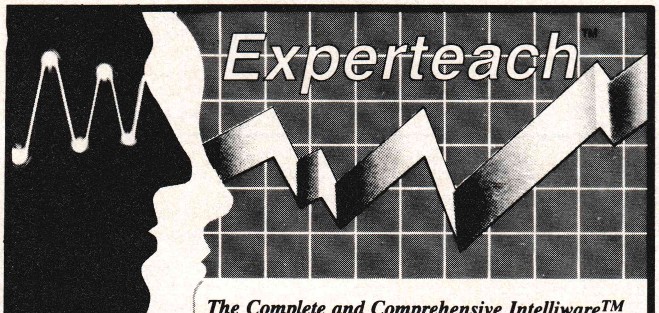
Arizona Residents add 5% Sales Tax. C.O.D. add additional $5.00 per order. Orders outside U.S. and Canada add $20.00 per shipment for postage (U.S. Currency only).

Circle no. **160** on reader service card.

(Listing continued, text begins on page 84)

```
2682:                996 * REST OF BUFF MORE THEN NEEDED
2682:          0200  997 MIDBUFF    DS     512
 234B ABORTMSG      23F9 BEO              2409 BE1             FF3A BELL
 2235 BITMAP          D2 BLOCK1             D3 BLOCK2         ?  D4 BLOCK3
   D5 BLOCK4          D6 BLOCK5         ?   D7 BLOCK6             46 BLOCKNUM
 223E BM2             44 BUFFADR          23F1 BUFFERROR        2657 BUFFER
 2118 C1            211C C2               2124 C3               2126 C4
 2201 CB1           2215 CB2              2218 CB3              2277 CD0
 2286 CD1           2295 CD2              22AA CD3              22BA CD4
 21E5 CE            2250 CHECKDEV         222B CL1              2228 CLEARBUFF
 264A CLEARDIR      21E2 CLEAREND           42 COMMAND         ?210C COMPUTE
 2169 CONT          FDED COUT             FD8E CROUT              8D CR
 22D9 DA1           22E9 DA2              22D1 DEVABORT         BF1A DEVADR51
 BF31 DEVCNT        BF32 DEVLST             06 DIRBLOCKS        22EF DIRFOUND
 2564 DISPVOL       2566 DV0              2576 DV1              2578 DV2
 258B DV3           218F ENDSSD             00 EOL              217E EX1
 218E EX2           217A EXIT             BEF5 GETBUFF          2541 GETKEY
 2544 GK1           FC58 HOME             C000 KEY              2190 MAIN
 2682 MIDBUFF       264B MLIWRITE         BF00 MLI             ?2651 MLIREAD
 21B3 MN1           259B MSG              24B3 NOBUFF           D0A2 NODEV
 22CB NODIR         21B6 R1                 48 RAMBANK         ?2655 READBLOCK
?2653 READBUFF     ?2156 READBYTE           01 READ             21B4 RELOCATE
 2106 S1              08 SAVEBYTES        21C8 SD1              213C SETBLOCK
 21C1 SETDEV        21D7 SETVECTOR          02 SSDCODE          C0D1 SSDHI
 214C SSDIO         C0D0 SSDLOW           2100 SSDSTART         C010 STROBE
   4A TEMP        ?   00 TEMPZERO         2554 TI1              2563 TI2
 254F TITLE       ?   43 UNITNUMB         2631 VOLNAME          265C VOLUME
 BE00 WARMDOS       240F WHEREMSG         2397 WHERETO         ?  02 WRITE
 264F WRITEBLOCK    2161 WRITEBYTE        21EF WRITEDIR         239C WT0
 23AC WT1           23CB WT2              23DA WT3              23E8 WT4
** SUCCESSFUL ASSEMBLY := NO ERRORS
** ASSEMBLER CREATED ON 14-JUN-83 09:55
** TOTAL LINES ASSEMBLED    997
** FREE SPACE PAGE COUNT    87
```

End Listing



The Complete and Comprehensive Intelliware™ Laboratory for Expert System Concepts on the IBM Personal Computer.

Experteach Includes:

- Comprehensive Introduction to Expert System Concepts.
- On-line Tutorial Describing the Operation of Expert Systems.
- Lisp Based Expert System Tools with Source Code.
- Prolog Based Expert System Tools with Source Code.
- dBASE II™ Based Expert System Tools with Source Code.
- Pascal Based Expert System Tools with Source Code.
- Complete Lisp Interpreter for the IBM PC®.
- Complete Prolog Interpreter for the IBM PC.
- Comprehensive Case Studies of Several Major Expert Systems.
- Comprehensive bibliography on Expert Systems.

Experteach is a comprehensive guide to Expert System technology consisting of a uniquely integrated collection of Expert System tutorials, case studies, on-line teaching programs, Expert System building tools with source code and Artificial Intelligence languages. Experteach is based on extensive experience in teaching Expert System concepts in association with IEEE, ACM and the Continuing Education Institute.

Experteach introduces you to Expert System technology by allowing you to build Expert Systems and to experiment with a variety of Artificial Intelligence tools and languages on the IBM PC.

Experteach includes eight rule-based Expert System shells with source code implemented in Lisp, Prolog, dBASE II and Pascal. Each language has been used to implement both a forward chaining and a backward chaining Expert System shell with a built-in rule editor, inexact inference and how & why explanation facilities.

Experteach includes a comprehensive Lisp interpreter and a complete Prolog interpreter with DEC-10 Prolog syntax. Experteach requires only 256K of memory.

Intelliware, Inc., 4676 Admiralty Way Suite 401 Marina del Rey, CA 90291 (213) 827-1334

☐ Introduction to Expert System Concepts, On-line Tutorial, Case Studies, Bibliography and Pascal Based Tools $99.00.

☐ Lisp, Prolog or dBASE II Based Tools $99.00 each.

☐ Complete Experteach System with Lisp and Prolog Interpreters. $475.00 Check, Money order, Visa or Mastercard. $9.00 for postage and handling. California, 6.5% tax.

Intelliware, Inc.

Experteach and Intelliware are trademarks of Intelliware, Inc. IBM PC is a registered trademark of IBM. dBASE II IS A TRADEMARK OF Ashton-Tate.

Circle no. **65** on reader service card.

CP/M™

UPGRADES - FROM $49.95!

ConIX Operating System: Adds more UNIX™-like features to any 48K+ CP/M-80 or compatible micro then ever before. It's a total upgrade for CP/M! Includes I/O Redirection and Pipes (uses memory or disk), perfected User Areas, Command and Overlay Path Searching, Auto Screen Paging, 8Mb Print Buffering, 22 new SysCalls, Function Keys, "Virtual" disk system, Archiver (saves over 50% disk), extensive command language, 300+ variables, 100+ commands, and even more! Uses 1/2K TPA, 0-27K disk minimum. 60-second install time!

ConIX Library I - XCC Utilities: Over 20 utilities written in the ConIX shell language, including hierarchical directories, interactive debugger, move/copy/link multiple files, print files with pagination, review disk files for deletion, unerase disk with stats, full-screen TYPE, and more. Source code included!

"(ConIX) goes a great deal farther in flexibility than any other CP/M shells. . . this system has all of its competitors beat." *As reviewed in Computer Language, June 1985.*

- ConIX Basic System: List $99.95, *Special - only $49.95*
- ConIX Programming System: List $99.95, *Special - only $49.95*
- Both Systems 100% Complete: List $165, *Special - only $79.95*
- ConIX Pull-Down Menu: List $35, *FREE with any ConIX system*
- ConIX Library I: List $49.95, *with any ConIX system only $34.95*

Prices include manual, 8" disk, and user support. 5¼" conversions 48TPI $6, other $10. Shipping: $4.50 UPS, $10 Canada, $15 overseas. NY residents add sales tax. Dealers wanted - *special incentives!*

Computer Helper Industries Inc.
P.O. Box 680 Parkchester Station, NY 10462
800-628-2828 X513 24hr. order hotline - COD only
212-652-1786 M-F:10-6 sales/technical staff

UNIX: AT&T Bell Labs, CP/M: Digital Research, ConIX: Computer Helper Ind.

Circle no. **129** on reader service card.

No source code for your REL files?

REL/MAC

converts a REL file in the Microsoft™ M80 format to an 8080 or ZILOG™ Z80 source code MAC file with insertion of all public and external symbols.

- **REL/MAC** makes MAC source files
- **REL/MOD** lists library modules
- **REL/VUE** displays the bit stream
- **REL/PAK** includes all of the above
- 8080 REL/MAC **demo disk** $10.00

REL/PAK for 8080 only $99.95
REL/PAK for Z80 & 8080 .... $134.95
on 8"SSSD disk for CP/M™ 2.2

Send check, VISA, MC or C.O.D. to

MICROSMITH COMPUTER TECHNOLOGY
P.O. BOX 1473, ELKHART, IN 46515
1-800-622-4070
(Illinois only 1-800-942-7317)

Circle **no. 103** on reader service card.

ICs PROMPT DELIVERY!!!
SAME DAY SHIPPING (USUALLY)

OUTSIDE OKLAHOMA: NO SALES TAX

640 Kbyte MOTHERBOARD KITS: IBM PC/XT Zenith 150 & 100, Compaq Portable & Plus: $65.00

V20	CPU µPD70108D-8			$16.00
8087-2	Math Coprocessors			140.00
DYNAMIC RAM				
256K	64Kx4	150 ns		$8.45
256K	256Kx1	120 ns		3.25
256K	256Kx1	150 ns		2.47
128K	128Kx1	120 ns		5.20
64K	16Kx4	150 ns		2.75
64K	64Kx1	150 ns		1.00
EPROM				
27C256	32Kx8	250 ns		$9.99
27256	32Kx8	250 ns		4.75
27C64	8Kx8	150 ns		3.99
2764	8Kx8	250 ns		2.25
STATIC RAM				
6264LP-15	8Kx8	150 ns		$3.25

QUANTITY ONE PRICES SHOWN
NEW! 100 ns 256Kx1 D-RAM @ 5.15

OPEN 6½ DAYS: WE CAN SHIP VIA FED-EX ON SAT.

ORDERS BY Th: Std Air Fr: P-One NO EXTRA COST ON F-EX SAT DELIVERY

MasterCard/VISA or UPS CASH COD
Factory New, Prime Parts µP∞
MICROPROCESSORS UNLIMITED, INC.
24,000 S. Peoria Ave., BEGGS, OK. 74421 **(918) 267-4961**

Prices shown above are for Nov. 18, 1985

Please call for current prices. Prices subject to change. Please expect higher or lower prices on some parts due to supply & demand and our changing costs. Shipping & insurance extra. Cash discount prices shown. Orders received by 6 PM CST can usually be delivered to you **by the next morning, via Federal Express Standard Air @ $6.00, or Priority One @ $13.00!**

Circle **no. 105** on reader service card.

HISOFT

HIGH QUALITY SOFTWARE **CP/M**

HiSoft has been selling Z80 CP/M software in Britain and Europe for over 4 years. Now we'd like to introduce **you** to our range of programming languages:

HiSoft Devpac: Z80 assembler/editor/debugger
HiSoft C: Kernighan/Ritchie implementation
HiSoft Pascal: fast, **standard** compiler

All at $69 inclusive each.

These programs are also available for other Z80 machines including Timex 2068.

Call or write for full technical details and press commentaries, or order from:

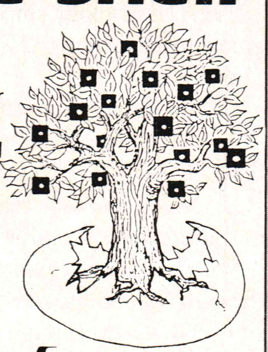
HISOFT
180 High St. North
Dunstable LU6 1AT
ENGLAND
01144 (582) 696421

VISA

Circle **no. 134** on reader service card.

Tree Shell

A Graphic Visual Shell for Unix/Xenix End-Users and Experts Alike!



Dealer inquiries welcomed.

COGITATE

"A Higher Form of Software"
24000 Telegraph Road
Southfield, MI 48034
(313) 352-2345
TELEX: 386581 COGITATE USA

Circle **no. 81** on reader service card.

ASSEMBLERS

We will support you on over 20 UNIX and Xenix based machines. Targets:

Fairchild	F8/3870
Hitachi	6301, 6305, HD64180
Intel	8041, 8048, 8051, 8080 8086 family
Motorola	6800, 6801, 6805, 6809 68HC11, 68000 family
NSC	800
RCA	1802
Rockwell	6502/65c02
Texas Inst.	TMS7000
Zilog	Z8, Z80

UNIWARE™

SOFTWARE DEVELOPMENT SYSTEMS, INC.
3110 Woodcreek Drive
Downers Grove, IL 60515 U.S.A. (312) 971-8170
England: Unit C, Ltd. (0903) 205233

UNIX is a Trademark of AT&T Bell Labs
Xenix is a Trademark of Microsoft

Circle **no. 115** on reader service card.

UNIVERSAL CROSS-REFERENCER

- **IT WORKS WITH ALL LANGUAGES**
  BASIC, C, PASCAL, FORTRAN, COBOL, ASSEMBLER, dBASE . . . you name it.
- **IT HANDLES** standard languages, extended languages & exotic languages.
- **IT CONFIGURES** to your compiler, interpreter, or assembler — ALL BRANDS — ALL VERSIONS.

INTRODUCTORY PRICE **$39.95**

$3.00 S/H - MC/Visa/Check - 6% Texas Sales Tax

For the IBM PC, XT & compatibles. DOS 2.0+

DALSOFT SYSTEMS
3565 High Vista - Dallas, TX 75234
(214) 247-7695

Circle **no. 86** on reader service card.

THE HAMMER
Software Tools in C

"I have already saved weeks of coding . . . thank you for providing such a useful tool . . . " G.T.

Let **The HAMMER Library** of over 150 routines save you valuable development time and effort:

LIBRARY FUNCTIONS
- **Multi-level 123-like MENUS**
- **DATA ENTRY**
  - MULTI-FIELD mode for Full-Screen data entry
  - Single-Field mode for individual fields
  - Data Verification
  - Full Editing within each field
  - Strings, dates and fixed decimal numbers
  - "Option" fields force user to pick from a given set
- **SCREEN MANAGEMENT**
  - cursor positioning
  - display boxes & tables
  - full attribute control
  - scrolling and clearing
- Date/time/string conversions
- BIOS access/pattern matching/**and more**

SUPPORTS: Microsoft C 3.00 • CI-C86 • M W C86 • DeSmet C • Lattice

INCLUDES source code and manual $195 plus shipping VISA/MC accepted

O.E.S. SYSTEMS
1906 Brushcliff Rd. • Pittsburgh, PA 15221
412/243-7365

Circle **no. 137** on reader service card.

FORTH
and Assembler for

65802/816

16 bit Processing for Upgraded 6502 Systems

Forth, Assembler, and Debugger for 65 Series Processors On a VAX or PC*

Starlight Forth Systems
15247 N. 35th St
Phoenix, AZ 85032
(602) 992–5181

*65802 on Standard 6502 systems

Circle **no. 142** on reader service card.

C Users' Group

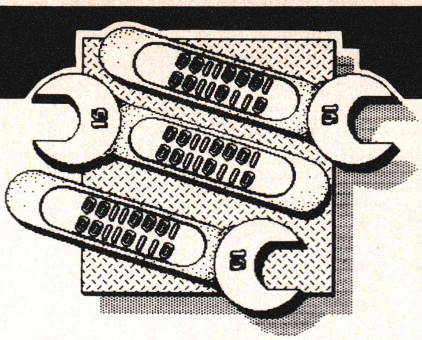
Over 60 volumes of public domain software including:

- compilers
- editors
- text formatters
- communications packages
- many UNIX-like tools

Write or call for more details

The C Users' Group
Post Office Box 97
McPherson, KS 67460
(316) 241-1065

Circle **no. 63** on reader service card.



by Ray Duncan

The programs published in this month's column are available for downloading from the Laboratory Microsystems RBBS at (213) 306-3530 (300 baud or 1200 bps).

Microsoft Assembler

I never cease to be astonished at the flurry of letters that results every time we publish something about the Microsoft Macro Assembler.

J. C. Hoisington of Morgan Computing (publisher of Trace86 and Professional Basic) writes: "We switched from IBM to Microsoft at Version 2.0. That means we didn't get SALUT but we did get to upgrade to Version 3.0 early this year for $75.00. Version 3.0 finally corrects many of the errors (and ridiculous restrictions) of earlier versions. The most useful to us is that they finally allow

```
lods byte ptr es:[si+0]
```

"which assembles as 26AC. I still found many bugs in Version 2.0, but 3.0 seems to have very few glitches."

David L. Rabbers, of Seattle, Washington, writes: "Regarding the errors [published in previous columns] two of them are yours, not the assembler's. Specifically, any constant ending in b or B is always treated as binary, and any constant ending in d or D is always treated as decimal. This is true regardless of the current radix setting. So, if you set the radix to 16, you must see to it that hex constants ending in b, B, d, or D are followed by an h or H. A little inconvenient, but how else could you specify binary or decimal constants in the midst of radix 16?

"One feature of Microsoft MASM Version 3.0 is a new linker that supposedly supports simple overlays. Unfortunately, there is no hint that I can find on how to use this feature. If you know how, or discover how, *please* publish it." Good point. My manuals don't breath a word about the construction of overlays. Anyone out there have some inside information on this subject?

Robert A. Blair, of Walnut, California, made the same point about radix overrides and went on to say: "This assembler should be used in Computer Science courses in college as an example of the wrong way to design a compiler; it is the worst I have ever seen. If you thought that Version 1 had a zillion bugs, wait until you use Version 2 for a while.

"I have to define my data before I use it (I thought I only had to do that in Pascal) or explicitly tell the compiler where it is to avoid phase errors. A multi-pass compiler should be able to figure out where the data is located without my having to tell it. The accompanying assembly listing shows a few errors that I know about. The 80286 PUSH immediate instruction generates the wrong length for some values. It will generate an instruction that requires two bytes of immediate data and only inserts one byte, or generates an instruction that requires one byte of data and inserts two bytes. The OFFSET operator causes link errors occasionally. The MASK used with HIGH does not work . . . These are just the tip of the iceberg." Robert's contribution accompanies the column as the listing (page 106).

Converting to DOS 3

Dan Daetwyler is a regular correspondent to *Doctor Dobb's* and always has something interesting to say. This month he shared some of his experiences with the latest version of DOS: "When DOS 2.0 introduced the concept of a file handle, I looked it over fairly carefully, and then decided we were being shown 'the way to go.' I went. It was a nice concept, and effectively the number of file handles that could be used at one time was unlimited. They made it so you could not use more than 99 handles at once—a good, typical effort by programming to cope with the concept of infinity on a finite machine. This was all well and good, since no one was going to have more than 99 files going on a PC.

"Then along came the new Version 3.x DOS. Gee, it just *had* to be better (and bigger), and all that good stuff. I read the new features section, and there *were* a couple of goodies. I devoured them carefully, and put them to immediate use. I bought Version 3.0, even though each time I swear I'll wait for the x.1 release—I get so tired of fighting MS bugs. Still, I bought it, and the Technical Reference, and really thought I read the documentation thoroughly. Along came Version 3.1, for which I breathed a large sigh of relief, since I could now stop fighting DOS bugs and worry about my own. And then I hit the thing with one of my moderately large complex systems. And bounced like a rubber ball.

"Buried in the details of the FILE statement in the CONFIG dissertation is a neat little statement that they've arbitrarily reduced the number of active handles to 20! The constraint is for a process, which is interestingly undefined, but you can assume it's a DOS job or task. The horrible part is, they meant it!

"So 20 isn't too bad a constraint. There won't be too many people who want to exceed that limit. Well, on the same page there's a note that five of the handles are grabbed by DOS.

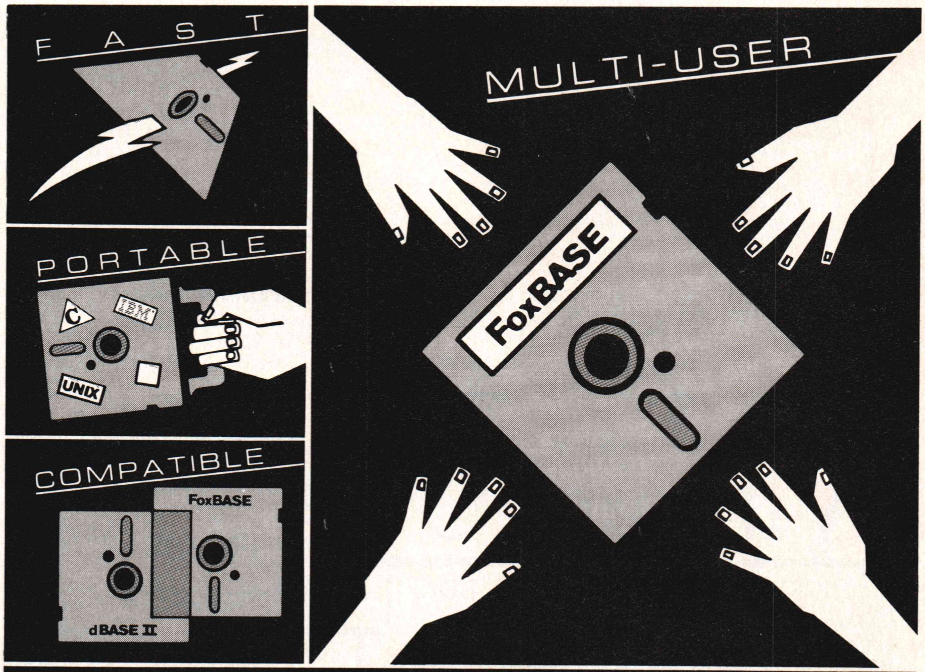
That's very true. So now you're down to 15. Still a reasonable number? Not in my estimation. Let's follow through on a reasonably complex data base problem. We've got several—let's say five—master files, each of which is indexed. The three primary files have double indices, while the less important two have only a single index. Five plus three times two plus two gives us thirteen. Still safe? Not really. As you're aware, the only way you can force a buffer purge in DOS is to pseudo-close a file. Doing this with a duplicate handle permits you to avoid the killing performance of a re-open. Let's be stingy. We'll only use one handle for this purpose. We've still got one left. However, I've yet to write a system that doesn't have at least three and sometimes half a dozen supporting files for archives, output, etc. The net result is that you end up short about five handles, even on a relatively small system."

Dan's idea of a "relatively small system" would give many of us nightmares. Note how Dan offhandedly supplies the reason for the existence of that mysterious DOS function 45H called DUP, whose "explanation" in the DOS Technical Manual is "Purpose: returns a new file handle for an open file that refers to the same file at the same position." I had always been perplexed by this function, and the Unix manuals weren't any more helpful than the DOS manual. By the way, the 5 handles preassigned by DOS to the Standard Devices aren't really lost. You can always close them, and then reuse them for some other file or device.

Dan writes on: "My current effort involves a minimum of 33 handles, and even that makes me uncomfortable. Goodbye to DOS Version 3.x. Except I can't! I can't really lock a customer into the old DOS. Especially with multi-tasking 'right around the corner.'

"If you think this tale has a happy ending, you're wrong. Let me tell you some of the things I've tried. You can set up a resident task, split the data base, and let the resident task own part of it. The catch is that if you try to communicate with the resident task, you're running under the main task control structure, and DOS will tell you that the access isn't authorized. I haven't figured out how DOS knows, as yet, so I can't figure out how to switch task structures. The traditional use of a user interrupt vector doesn't work. DOS senses this and tells you again that the access is not authorized. Setting the file up with the proper attributes for a shared resource, and loading SHARE, doesn't help. I guess I could fight through a disassembly of DOS and find out what they're doing, but I don't want to spend the rest of the summer on this.

"I started to drop back to my own FCBs, and drop the handle concept. There's no limit to the number of files I can open, then, but then I'm back to the problems of the pre-handle DOS, and I can't see any way to purge the buffers. I can't really see exposing my customer to loss of data base when the power drops unexpectedly. I can't actually give him total integrity, but using the pseudo-close purge gets the risk factor down to the noise level. I've three of the complex database



FoxBASE.

The DBMS That Bridges The Gap Between Single-user And Multi-user.

Unsurpassed Program Development Speed.

FoxBASE™ uses a state-of-the-art B+ Tree index structure for quicker, more efficient data access. A sophisticated virtual storage technique becomes an invaluable timesaving device as it works to insure that frequently referenced programs are retained in memory in compiled form. What's more, FoxBASE provides automatic 8087/80287 math coprocessor support for ultraquick program execution speed—as much as six times the speed of dBASE II.®

Highly Portable.

FoxBASE is much more than a relational database management system. Written in C, FoxBASE is an extremely portable interpreter/compiler. Now you can port from one machine or operating system to another without changing your applications. And this portability protects your investment in programs by insuring their use in future machine and operating system environments.

dBASE II Compatible.

FoxBASE is both source language—including full macro usage—and data file compatible with the dBASE II database language. This means your existing dBASE II databases can be used unchanged. Furthermore, it puts thousands of public-domain and commercially available dBASE II programs at your disposal.

Available Under Multi-user Systems.

Our multi-user versions of FoxBASE feature many additional enhancements. Like automatic file-locking and record-locking capabilities. Use of termcap, so FoxBASE can run on virtually any terminal. And, with some versions, a two billion record file capacity.

Multi-user Versions:
Xenix® $995. MultiLink™ $995.
IBM-PC NET™ $995.
Single-user Versions:
MS/PC-DOS™ $395. AOS/VS $995.

Don't be outfoxed by the others.
Call or write Fox Software today.

FoxBASE™

From
FOX SOFTWARE, INC.

27475 Holiday Lane, Perrysburg, OH 43551
419-874-0162

FoxBASE is a trademark of Fox Software, Inc. dBASE II is a registered trademark of Ashton-Tate. Xenix is a registered trademark of Microsoft Corp. MultiLink is a trademark of The Software Link, Inc. IBM-PC NET is a trademark of IBM Corp. MS/PC-DOS is a trademark of Microsoft Corp.

Circle **no. 94** on reader service card.

9 TRACK TAPE CONTROLLERS AND ½" TAPE SUBSYSTEMS

MODEL TC-PC

TC-PC is a high performance 9-track tape controller for the IBM-PC with these important features:

- Reads and writes industry standard ½-inch tape
- Compatible with most formatted tape drives
- Standard 8-bit parallel recording with parity, and read-after-write verification
- Switch selectable I/O address (four contiguous ports required for operation)
- Maximum data transfer rate of 192,000 bytes per second
- Record length from 1 to 65,535 bytes
- Supports up to 8 tape transports
- Jumper selectable DMA channel
- Modes: PE and NRZI at 800, 1600, 3200 and 6250 bytes/inch
- Installable device drivers allow creation of application programs which run under IBM XENIX and MS-DOS
- Operates with IBM-PC and -XT; Compaq Portable; Zenith PC-150; Sperry PC; the Leading Edge Computer, and other 100% IBM-PC compatible equipment.

MODEL TC-50

TC-50 offers all the standard features of the TC-PC with these additional enhancements:

- Maximum data transfer rate of 400,000 bytes/second; 904,000 bytes/second with memory option
- Operation with a wider range of IBM-compatible machines, including IBM-AT; Compaq Desk Pro; ATT 6300 and others

XENIX and MS-DOS are Registered Trademarks of Microsoft Corp.
IBM-PC/AT/XT are Registered Trademarks of International Business Machines Corp.
Compaq Portable and Compaq Deskpro are Registered Trademarks of Compaq Corp.
AT&T 6300 © AT&T Information Systems Corp.
Sperry PC © Sperry/Univac Corp.
Zenith PC-150 © Zenith Data Systems
Leading Edge is a Registered Trademark of Leading Edge Products, Inc.

A variety of software utilities is supplied as part of the TC-PC and TC-50 packages, including:

- **DEPOT (Data Exchange Program with Optional Translation)**
  DEPOT provides a means to transfer data between system disk and magnetic tape, allowing:
  — Data interchange from tape to disk, and disk to tape
  — Conversion from ASCII to EBCDIC, and vice versa
  — Positioning to arbitrary location prior to data read
  — Specification of record length and block factor when writing from disk to tape; allows deblocking when reading from tape to disk
  — Multiple operations to be specified from a command file
- **TAU (Tape Archive Utility)**
  — Provides individual file backup and restore
  — Allows use of MS-DOS wild cards such as "*.*"
  — Provides disk drive selections for I/O
  — Changes pathname selections from within TAU
  — Provides data encryption for security

WARRANTY

All Overland Data products carry a 30-day unconditional money-back guarantee, and are warranted for one year, parts and labor.

OVERLAND DATA, INC.
5644 Kearny Mesa Road #A
San Diego, CA 92111
Tel. (619) 571-5555

Circle **no. 73** on reader service card.

Vitamin C

A Healthy Supplement For C Programmers

SCREEN I/O FEATURES INCLUDE:

- dBase-like atsay(), atget(), readgets()
- Input formatting via picture clause
- Unlimited input validation
- Individual field color/attribute control
- Field specific help messages
- Status line for added field specific prompts
- Right-to-left numeric input with floating dollar signs, asteriks, and commas
- Insert/delete, next/previous field, etc
- Current field highlighting
- Fast, easy, and bulletproof

PERFECT WINDOWS

- Automatic interface with all screen I/O functions
- Full overlay and restore
- Multiple virtual screens
- Full collision protection
- Automatically keeps I/O within window boundries
- Grow, shrink and move
- Word wrap & margins
- Print to or scroll any window without colision even if it is overlayed by another!
- Much, much more!

More than just another function library! A well planned, fully integrated programming system complete with pull down menus & user help system!

Vitamin C • $149.95

Includes more features than there is room to mention, all source code, manual, tutorial and sample programs. No royalties on your applications. For most MS-DOS C compilers! Soon for UNIX / XENIX ! Include $3 shipping, $6 for second day. Phone orders with MC/Visa welcome! Prices & features subject to change without notice. Call for other products.

CREATIVE PROGRAMMING
(214)243-6197
Box 112097
Carrollton, Texas 75011-2097

Circle **no. 82** on reader service card.

systems out now, and in use on about fifty machines. We're semi-rural, and the power fluctuation during thunderstorms has to be seen to be believed, yet I've never (knock wood) lost a database from that source, since I started using the pseudo-close.

"So right now, I'm stuck. I can't move two of my systems to DOS 3.x, and the new one isn't even in the ball park . . . So this tale ends with questions. Do you know anything of help in this area?"

Actually, even the DOS 2.1 manual (pages 4-10) said that the maximum number of handles that a process could have concurrently open was 20, but that the maximum for the system was 99. This apparently includes background tasks such as the print spooler. Perhaps they just didn't enforce the process maximum. The manual for DOS 3.1 specifies the maximum for the system can be in the range 8-255, but again the maximum per process is 20. For those of you who are still using FCBs for whatever reason, be warned that DOS 3.1 puts some new and fairly strict restrictions on the use of FCBs when the file sharing module is also loaded. The default maximum number of FCBs that can be simultaneously open is 4. If you try to open more than your maximum, DOS unilaterally closes the least recently used FCB. You can increase the maximum allowed number of simultaneously open FCBs by a command FCBS=nn in the CONFIG.SYS file, just as FILES=nn works for handles. This is an omen, I believe, that FCBs are as doomed as the dinosaurs.

Microsoft and IBM have issued particular warnings about use of FCBs in the networking environment. If you use an FCB to access a file and fail to close it (a very common thing to do when you are using the file for read only), the system can bog down due to excessive connections accumulating across the network. Also, they remark that moving FCBs around in memory after they are opened can cause problems.

Dan proceeds: "Tale two is slightly more amusing. When I got my AT, and then started hearing all the terror stories about the hard disk, I consid-

ered myself very fortunate when I didn't encounter any . . . for a while. Then I had to load a 5 Mbyte database, and my trouble started. After several days of frustration, I nailed my friendly dealer to the wall, and IBM emergency shipped a replacement hard disk, which made life a lot better. In the interim, I did several interesting things. I put a trap in the program so that any time the I/O failure occurred, I'd get control. I was running under DOS 3.0, of course. The first thing I discovered was that when the disk glitched, the error code that DOS gave me back had no relation to disk I/O at all. In fact, DOS kept insisting that I was 'out of memory.' On a half megabyte machine with one small application?—not bloody likely.

"The next thing I discovered was that if I simply tried the operation again, by looping back to the interrupt, 99% of the time the thing worked happily on the second try. Very interesting! Then I discovered by accident that I was running with VERIFY=OFF. So I changed to VERIFY=ON, and got a whole new set of behavior patterns. Different error codes, and the fail ratio went way down. Running in this mode, the problem seemed to be occurring when DOS encountered something it thought was a bad track, so I offloaded my 20 Mbyte disk, and reformatted. Oh boy. The plot thickens like glue. I could run FORMAT repetitively, and every time I ran it I would find a different set of 'bad tracks.' There didn't even seem to be a consistent pattern. I believe it did have a relationship to something, but as near as I could detect, it was the phases of the moon, or the position of Jupiter.

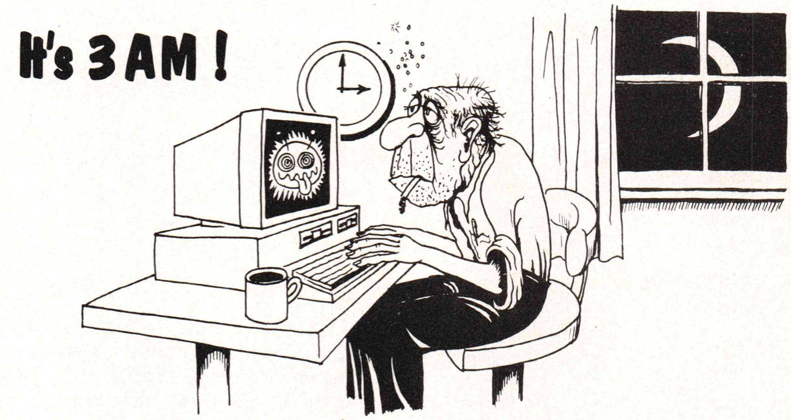
"I won't bore you with more of the experiments that cost me about ten days of time, but I will tell you the punch line. We all heard about the hard disk problems in all of the trade journals. IBM replaced hard disks left and right, and the disk vendor was the bad guy. Very interesting, since, when I got Version 3.1, all the problems disappeared. Now DOS gives back the correct error codes. Now FORMAT is at least consistent."

Dan's second tale is the latest of a raft of mutually exclusive explanations of the mysterious AT hard disk problems. We have heard that the original hard disk was no good because the vendor tried to ramp up production too fast (and a recent review of the CMI hard disk showed it to be much more shock-sensitive and error-prone than its competitors); that the FORMAT program had a bug that prevented it from actually checking the second half of the 20 Mbyte hard disk; that the disk controller had design or component problems; and so on. Throughout most of this time, the official IBM press flacks insisted that everything was wonderful and there was no AT disk problem at all. It certainly makes one apprehensive about the position we'll all be in if IBM manages to knock off all its competitors in the PC market.

DDJ

(Listing begins on next page)

Reader Ballot
Vote for your favorite feature/article.
Circle Reader Service **No. 197**.



Do you know where your bugs are?

This C programmer is finding his bugs the hard way...one at a time. That's why it's taking so long. But there's an easier way. Use

PC—Lint

PC—Lint* analyzes your C programs (one or many modules) and uncovers glitches, bugs, quirks, and inconsistencies. It will catch subtle errors before they catch you. PC—Lint resembles the Lint that runs on the UNIX* O.S., but with more features and some awareness of the 8086 environment.

- Full K&R C
- Supports Multiple Modules—finds inconsistencies between declarations and use of functions and data across a set of modules comprising a program.
- Compares function arguments with the associated parameters and complains if there is a mismatch or too many or too few arguments.
- User-modifiable library description files for most major compilers.
- All warning and information messages may be turned on and off globally or locally (via command line and comments) so that messages can be tailored to your programming style.
- All command line information can be furnished indirectly via file(s) to automate testing.
- Use it to check existing programs, programs about to be exported or imported, as a preliminary to compilation, or prior to scaling up to a larger memory model.
- All one pass with an integrated preprocessor so it's very fast.
- Has numerous flags to support a wide variety of C's, memory models, and programming styles.
- **Price: $139.00 MC, VISA**
(Includes shipping and handling) PA residents add 6% sales tax. Outside USA add $10.00
- Runs under MS-DOS* 2.0 and up, with a minimum of 128Kb of memory. It will use all the memory available.

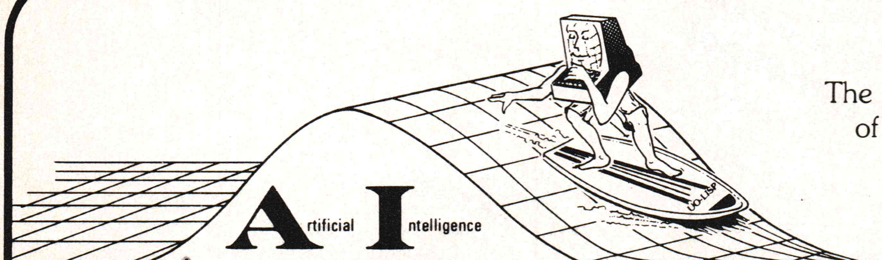
Trademarks: PC—Lint *(Gimpel Software)*, UNIX *AT&T)*, MS-DOS *(Microsoft)*.

GIMPEL SOFTWARE
3207 Hogarth Lane • Collegeville, PA 19426
(215) 584-4261

```
                                             page    55,132
                                             title   Microsoft Assembler Bugs
                                             .286C

                                     ; Some IBM PC Macro Assembler 2.0 "features"
                                     ; contributed by Robert Blair

 0000                                foo     segment para public 'CODE'
                                             assume  cs:foo
 0000                                foos    proc    far
 0000  E9 010B R                             jmp     foobar
                                                                 ; this bug causes link errors if
                                                                 ; the offset is larger than 256.
                                                                 ; the error is
                                                                 ; 'fixup offset exceeds field width'
 0003      02 [                              dw      2 dup (offset foobar)
                 010B R
                        ]


                                                                 ; this will work ok
 0007      02 [                              dw      2 dup (foobar)
                 010B R
                        ]


 000B  0100 [                                db      256 dup (0)
                 00
                    ]


 010B  CB                            foobar: ret

                                     ; it appears that if any calculations are required, the compiler
                                     ; truncates after the first two bytes.  The assembler reference
                                     ; manual p. 2-15 states this is done for the small assembler but it
                                     ; does it for both assemblers.

 010C  80 51 00 00                           dd      60*60*24        ; incorrect
 0110  80 51 01 00                           dd      86400           ; correct


                                     ; Now try HIGH and MASK operators together

                                     fooi    record  f1:1,f2:1,f3:3,f4:1,f5:1,f6:1,f7:8
 = 0200                              fc1     equ     0200h
 = 4000                              fc2     equ     4000h

                                                                 ; immediate data should be
 0114  25 0200                               and     ax,mask f5                        ; 0200h
 0117  25 4000                               and     ax,mask f2                        ; 4000h
 011A  25 0040                               and     ax,high (mask f2)                 ; 0040h
 011D  25 0042                               and     ax,mask f5+high(mask f2)          ; 0240h
 0120  25 4200                               and     ax,(high(mask f2))+(mask f5)      ; 0240h
 0123  25 0200                               and     ax,fc1                            ; 0200h
 0126  25 4000                               and     ax,fc2                            ; 4000h
 0129  25 0040                               and     ax,high fc2                       ; 0040h
 012C  25 0042                               and     ax,fc1+high fc2                   ; 0240h
 012F  25 4200                               and     ax,(high(fc2))+(fc1)              ; 0240h
 0132  25 4200                               and     ax,fc1 or high fc2                ; 0240h


                                     ; 80286 PUSH IMMEDIATE instruction bugs
                                     ; an op code of 6A requires one byte of immediate data
                                     ; an op code of 68 requires two bytes of immediate data

 0135  6A 00                                 push    0               ; 6a00 correct
 0137  6A 7F                                 push    127             ; 6a7f correct
 0139  6A FF                                 push    -1              ; 6aff correct
 013B  68 80                                 push    128             ; should be 680080
 013D  68 0080                               push    word ptr 128    ; generates correct code
 0140  68 FF                                 push    255             ; should be 6800FF
 0142  68 00FF                               push    word ptr 255    ; generates correct code
```

```
        0145  6A FFFF                          push    0ffffh         ; should be 6aFF or 68FFFF
        0148  6A 34                            push    byte ptr 1234h ; lost data with no error


                                       ; I have to define my data before use or tell the assembler
                                       ; where it is.  Multi-pass compilers should be smarter
                                       ; than this

        014A  2E: D7                           xlat    fred           ; causes (spurious) phase error
                                                                      ; message but generates right code

        014C  2E: D7                           xlat    cs:fred        ; works ok

                    FF [               fred    db      255 dup (0)
 E r r o r   ---        6:Phase error between passes
                        00
                             ]




                                       ; This bug is not very serious because the only thing wrong is
                                       ; the assembly listing.  The generated code is correct but the
                                       ; listing of the generated code is not very neat.

        U24C  0D 3D [D 0A                      db      13,10,13,10,61 dup ('-'),13,10
                        2D
                             ]
                          0D 0A


        028F                           foos    endp
        028F                           foo     ends
                                               end     foos
```

End Listing



LISP

The preferred symbolic processing language of the Artificial Intelligence Community

catch the next micro-wave with

UO-LISP

Not "just another pretty dialect" but the most powerful implementation of LISP available in the micro market place. For the professional engineers, researchers, and educators, UO-LISP maintains the power and flexibility inherent in LISP while providing the expected functionality of mainframe LISP systems. (+) **UO-LISP steps beyond the competition and provides a real source to native code compiler.**

CPU Family	Operating System	Production System	Learn System	Production plus Learn System
8086	MS-DOS	150^{00}	85^{00}	185^{00}
8086	PC-DOS	150^{00}	85^{00}	185^{00}
8086	CPM/86	*available soon*	—	—
Z80	CPM	125^{00}	85^{00}	160^{00}
Z80	TRS DOS	80^{00}	N/A	N/A

For MORE DETAIL AND TO ORDER:
Send for *FREE* brochures and order forms.

NORTHWEST COMPUTER ALGORITHMS
P.O. Box 1747, Novato, CA 94948
(415) 897-1302

Circle **no. 72** on reader service card.

ANNOUNCING! DR. DOBB'S COMPLETE TOOLBOX OF C

Dr. Dobb's Journal, the most respected source of technical software information available, brings you this collection of powerful programming tools for C.

New, from M&T Publishing and Brady Communications . . .

Dr. Dobb's Toolbook for C

Item #005

A comprehensive library of valuable C code.

Many of Dr. Dobb's most popular articles on C from sold-out issues are updated and reprinted in this unique reference, along with new C programming tools. **THE TOOLBOX** contain's C-compilers, line editors, assemblers, text processing programs, and more! Dr. Dobb's Journal offers **The Toolbook** in a special hardbound edition for only $29.95. You'll find:

- J.E. Hendrix's famous *Small C Compiler v. 2* and *A New Library for Small C* (also available on disk)
- Never before published: Hendrix's new *Small-Mac: An Assembler for Small C* and *Small Tools: Programs for Text Processing* (both available on disk)
- Ron Cain's original *A Small-C Compiler for the 8080's*
- Plus many useful programming tools in C

Also from M&T Publishing and Brady Communication—

The Small-C Handbook

Item #006 or #006A

The Small-C Handbook by James Hendrix is a valuable resource of information about the Small-C Compiler. In addition to descriptions of the language and the compiler, **The Handbook** also contains the entire source listings of the compiler and its library of arithmetic and logical routines. A perfect companion to the Hendrix Small-C compiler offered by Dr. Dobb's on disk, **The Handbook** even tells how to use the compiler to generate new versions of itself. All this is in **The Handbook** for only $17.95, Item #006; only $22.95 for **The Handbook** with the **MS/PC DOS Handbook Addendum**, Item #006A.

While both **The Toolbook** and **The Handbook** provide documentation for the Small-C Compiler on disk, **The Handbook** provides more complete documentation and is available with an Addendum for MS/PC DOS versions.

DR. DOBB'S C TOOLS ON DISK

To complement The Toolbook, Dr. Dobbs' also offers the following programs on disk. Source code is included, and except where indicated, both CP/M and MS/PC-DOS versions are available.

Small C Compiler

Item #007

Jim Hendrix's **Small-C Compiler** is the most popular piece of software published in Dr. Dobb's 10-year history. Like a home study course in compiler design, the **Small-C Compiler** and **The Small-C Handbook** provide all you need to learn how compilers are constructed, as well as teaching the C language at its most fundamental level. The **Small-C Compiler** is available for $19.95 in both CP/M and MS/PC DOS versions.

Both **The Toolbook** and **The Small-C Handbook** provide documentation for the compiler; however, **The Handbook** provides more complete documentation for both versions, and the **MS/PC DOS Small-C Handbook Addendum** is recommended in addition to **The Handbook** for MS or PC DOS specific documentation.

Small-Mac: An Assembler for Small-C

Item #012A

Small-Mac is a macro assembler designed to stress simplicity, portability, adaptability, and educational value. The package features simplified macro facility, C-language expression operators, descriptive error messages, object file visibility, and an externally defined machine instruction table. Included programs are: macro assembler, linkage editor, load-and-go loader, library manager, CPU configuration utility, and dump relocatable files. This program is available with documentation in the Small Mac Manual for $29.95. For CP/M systems only.

Small Tools: Programs for Text Processing

Item #010A

This package consists of programs designed to perform specific functions on text files, including: editing, formatting, sorting, merging, listing, printing, searching, changing, transliterating, copying and concatenating, encrypting and decrypting, replacing spaces with tabs and tabs with spaces, counting characters, words, or lines, and selecting printer fonts. Source code only is included. This program is available with documentation in the Small Tools Manual for $29.95. Both CP/M and MS/PC DOS versions available.

Special Holiday Packages—20% Off!

Now, for almost 20% off the individual product prices, you can order a complete set of Dr. Dobb's C programming tools for your CP/M or MS/PC DOS system!

CP/M C Package Only $99.95 Item #005A Ordered individually, these C tools sell for over $120! Order the CP/M C Package now and you'll receive **Dr. Dobb's Toolbook, The Small-C Handbook, The Small-C Compiler** on disk, **The Small Tools TextProcessor** on disk, along with documentation in **The Small Tools Manual, The Small-Mac Assembler** on disk, and **The Small-mac Manual**—all for only $99.95!

MS/PC DOS C Package Only $82.95 Item #005B Individually, these tools sell for over $100! Order now and you'll receive: **Dr. Dobb's Toolbook, The Small-C Handbook** with the **MS/PC DOS Addendum, The Small-C Compiler** on disk, **The Small Tools Text Processor** on disk, along with documentation in the **Small Tools Manual**—all for only $82.95!

		Check Format CP/M	MS/PC DOS		
Books	Dr. Dobb's Toolbook			$29.95	
	Small-C Handbook			$17.95	
	Small C Handbook with MS/PC DOS Addendum			$22.95	
Disks	Small-C Compiler (Toolbook or Handbook recommended for documentation)			$19.95	
	Small Tools Text Processor with Small Tools Manual			$29.95	
	Small Mac Assembler with Small Mac Manual (for CP/M only)			$29.95	
SPECIAL HOLIDAY PACKAGES	CP/M **C** Package			$99.95	
	MS/PC DOS **C** Package			$82.95	

Subtotal ______
Tax ______ % ______
Shipping ______
TOTAL ______

CA residents add applicable sales tax
Add $1.75 per item for shipping in U.S., $4.25 outside U.S.

For CP/M system disks only, please specify one of the following formats:
☐ Kaypro ☐ Apple ☐ Zenith Z-100 DS/DD ☐ Osborne ☐ 8″ SS/SD
Inquire about other formats.

PAYMENT MUST ACCOMPANY YOUR ORDER.

— Check Enclosed
— Charge my ☐ VISA ☐ M/C ☐ Amer. Exp.

Card # ______ Exp. ______
Signature ______
Name ______
Address ______ (Please use street address)
City ______ State ______ Zip ______

Please return this coupon along with your payment to: Dr. Dobb's Journal, 2464 Embarcadero Way, Palo Alto, CA 94303 For credit card orders, call toll-free: 1-800-528-6050 Ext. 4001 Refer to item numbers.

Please allow 4-8 weeks for delivery

3110A

Introduction to Using Your MacSCSI Host Adapter

by John Bass

The MacSCSI host adapter was designed to work with most SASI- and SCSI-compatible controller cards. It is also a reasonable starting point for other custom Mac interfaces. Source software written in Aztec C is provided for custom configuring your system. If your controller is Xebec S1410 compatible you should be up and running with little trouble.

Changing the Parameters for the Drive and Controller

For controllers other than the Xebec S1410, you may need to modify the last byte of the format, read, and write commands to reflect the vendor-specific requirements. The Xebec S1410 uses this byte to encode the step rate for the drive—as shipped, the code is set up to use a Seagate ST506 drive with the half-step strap enabled. If you are using a Xebec S1410 with another drive, consult your controller manual for the correct drive code to use. Then change the cmd.sc_vendor assignment from 1 to the correct drive-type code.

Because the Xebec defaults to an ST506-drive configuration we didn't need to issue any additional commands to define the drive configuration to the controller. This is an area that is very vendor specific—read your controller documentation very carefully. You will want to read the descriptions for the format, read, and write commands closely. Also check the error-code definitions carefully because they vary greatly between some controllers.

You may need to issue a Set Media or Set Mode command that defines the drive parameters for number of heads, cylinders, write precomp, write reduce, and so on. Some drives, such as the Xebec Owl, have an embedded controller and don't need such a setup parameter. Some controllers encode the parameters at format time and write them on the disk for future use. Other controllers require a Mode Select or other command to set the drive parameters prior to the first format, read, or write command.

The long evolution from early SASI controllers to the current proposed SCSI specification has left a lot of nonconforming controllers around the marketplace, and many more nonconforming controllers are likely to be produced before the standard is finished and adopted. Until then, the software drivers for each host adapter will need to be customized per controller.

A copy of the current SCSI (ANSC X3T9.2) specification is available from the American National Standard publications office. For NCR-5380 information contact your local NCR Microelectronics representative or write to the NCR Microelectronics Division, 1635 Aeroplaza Dr., Colorado Springs, CO 80916; (800) 525-2252.

Mounting Drives Inside or Outside the Mac

Several 5-, 10-, and 20-megabyte 3½-inch drives are now on the market, and controllers in the same form factor are available as well. The easiest way to mount a 3½-inch drive, controller, and power supply internally is to fabricate a sheet metal and/or Plexiglass mount and screw it inside the plastic back of the Mac. To get AC for your power supply, install a power cable to the video board after the switch and AC filters. Be sure to leave a long enough service loop on both the power and SCSI cables to make getting the back off easy.

Other internal mounting configurations require more attention to sheet metal design and choice of controller, drive, and power supply. Convection cooling can be enhanced by mounting everything on the right side and using the sheet metal and Plexiglass to form a chimney extending from the bottom to the vents at the top of the case. EMI fields from the power supplies, flyback, and yoke coils present some problems in getting the disk to operate without errors—proper selection of shielding material and position is critical.

The easiest way to interface drives to the MacSCSI is to mount them externally in a separate box, so that physical mounting, heat, and EMI problems are less severe. Several manufacturers have standard line enclosures. Some of these enclosures are complete with power supply, cables, fans, and maybe a drive of your choice.

External drives require an external cable. The SCSI standard specifies an EMI shielded cable, plug, and header assembly. We use AMP part number 1-499977-0 for the panel-mounted connector and AMP part number 102793-4 for the ground plane (shield assembly) that mates with the connector. Use the ground plane only if you plan to use a SCSI standard shielded cable—it will interfere with a standard nonshielded IDC ribbon-cable connector.

Installing the MacSCSI Board

Getting the back off a Mac requires a Torx 5 screwdriver with a long shaft. There are five screws: two are located at the top in holes under the handle, two are on the back toward the bottom above the connectors, and one is located behind the battery cover. Carefully use a wooden ruler or the battery cover to ease the crack along

PERFORMANCE PACKAGE

Blaise Computing Inc. introduces the PERFORMANCE PACKAGE™ for Turbo Pascal programmers.

TURBO PASCAL

NEW!

Turbo ASYNCH™

With Turbo ASYNCH, you can be in constant touch with the world without ever leaving the console. Rapid transit at its best. Turbo ASYNCH is designed to let you incorporate asynchronous communication capabilities into your Turbo Pascal application programs, and it will drive any asynchronous device via the RS232 ports, like printers, plotters, modems or even other computers. Turbo ASYNCH is fast, accurate and lives up to its specs. Features include...

◆ Initialization of the COM ports allowing you to set all transmission options. ◆ Interrupt processing. ◆ Data transfer between circular queues and communications ports. ◆ Simultaneous buffered input and output to both COM ports. ◆ Transmission speeds up to 9600 Baud. ◆ Input and output queues as large as you wish. ◆ XON/XOFF protocol.

The underlying functions of Turbo ASYNCH are carefully crafted in assembler for efficiency, and drive the UART and programmable interrupt controller chips directly. These functions, installed as a runtime resident system, require just 3.2K bytes. The interface to the assembler routines is written in Turbo Pascal.

Turbo POWER TOOLS™

Turbo POWER TOOLS is a sleek new series of procedures designed specifically to complement Turbo Pascal on IBM and compatible computers. Every component in Turbo POWER TOOLS is precision engineered to give you fluid and responsive handling, with all the options you need packed into its clean lines. High performance and full instrumentation, including...

◆ Extensive string handling to complement the powerful Turbo Pascal functions. ◆ Screen support and window management, giving you fast direct access to the screen without using BIOS calls. ◆ Access to BIOS and DOS services, including DOS 3.0 and the IBM AT. ◆ Full program control by allowing you to execute any other program from within your Turbo Pascal application. ◆ Interrupt service routines written entirely in Turbo Pascal. Assembly code is not required even to service hardware interrupts like the keyboard or clock.

Using Turbo POWER TOOLS, you can now "filter" the keyboard or even DOS, and create your own "sidekickable" applications.

The Turbo Pascal PERFORMANCE PACKAGE™ is for the serious Turbo Pascal programmer who wants quality tools to develop applications. Every system comes with a comprehensive User Reference Manual, all source code and useful sample programs. They require an IBM PC or compatible, utilizing MS-DOS version 2.0 or later. There are no royalties for incorporating PERFORMANCE PACKAGE functions into your applications.

Turbo POWER TOOLS and Turbo ASYNCH sell for $99.95 each, and they may be ordered directly from **Blaise Computing, Inc. TO ORDER, call (415) 540-5441**

YES, send me the Best for the Best! Enclosed is ________ for
☐ Turbo ASYNCH ☐ Turbo POWER TOOLS. (CA residents add 6½% Sales Tax. All orders add $6.00 for shipping.)

Name: ________ **Phone:** ________

Shipping Address: ________ **Zip:** ________

City: ________ **State:** ________

VISA or MC #: ________ **Exp. Date:** ________

Turbo Pascal is a trademark of Borland International. Turbo POWER TOOLS, Turbo ASYNCH and PERFORMANCE PACKAGE are trademarks of Blaise Computing Inc. IBM is a registered trademark of Internationl Business Machines Corporation. MS-DOS is a trademark of Microsoft Corporation.

BLAISE COMPUTING INC.

BLAISE *watch us!*

◆ 2034 BLAKE STREET
◆ BERKELEY, CA 94704
◆ (415) 540-5441

Circle **no. 159** on reader service card.

the front seam apart—do not use a screwdriver as a pry because the case plastic is very soft and will show pry marks.

Remove the power and floppy cables from the digital board, then gently slide it out of the sheet metal frame. Place the board on a table with the keyboard connector toward the back and the other connector near you. Lay the MacSCSI board near the ROMs with the SCSI header near you. Remove and transfer both of the Mac ROMs onto the MacSCSI board, then plug the MacSCSI board back into the ROM sockets.

Now clip the miniplug onto pin 8 of the TSM PAL located at D1 on the right edge of the board. Lay the clip flat against the board alongside the 15.667200 crystal and secure it with a piece of masking tape across the crystal and over the edge of the board. Route the wire between the switches and toroid coil and continue alongside the metal shield to the MacSCSI board. Replace the digital board in the frame, flexing slightly to pass the MacSCSI header past the edges of the frame. Be careful not to pull the board out of the ROM sockets. Cable the SCSI port as required, reconnect the power and floppy cables, and reassemble the case.

Bringing Up the System for the First Time

Once you have the system cabled up and have made any required software changes, try formatting the drive. Watch for the drive to be selected. On some drives you can see the positioner step from track to track, and on others you may be able to feel the drive stepping. Formatting takes a while—for 5- and 10-megabyte drives it may take several minutes, and 100-megabyte drives may need a half hour. The format routine initializes the Mac file system by writing a volume header and clearing all other blocks and then rereads all blocks to check for errors.

If you have problems with Aztec C you can add printfs to the C I/O routines and follow the progress. Once you have the format routine and I/O routines running, compile and link the driver with the I/O routines.

If you are connecting to something other than a disk you can simply include the I/O routines in your application and drive the SCSI bus directly.

Miscellaneous Comments

We have used MacSCSI under Finder 4.1 and Aztec C Shell 1.06D and F with a nonpartitioned 5-megabyte drive. Aztec C Shell and environment seem to run well even with a very large number of files. Finder has some limits you should keep in mind. On large volumes it gets pretty slow after 150 files. Finder also crashes sometimes when too many files get created. Deleting some files or the desktop under Aztec C sometimes makes it happy; at other times it seems that you need to back up the disk under Aztec C Shell and reformat the volume. We are working with

BOOKSHELF™

Fast, compact, high quality, easy-to-use CP/M system

Series 100

Priced from $895.00

10MB System Only $1645.00

Features
- Ready-to-use professional CP/M computer system
- Works with any RS232C ASCII terminal (not included)
- Network available
- Compact 7.3 x 6.5 x 10.5 inches, 12.5 pounds, all-metal construction
- Powerful and Versatile:
  - Based on Little Board/PLUS single-board computer
  - Two RS232 serial ports
  - One Centronics printer port
  - One or two 400 or 800 KB floppy drives
  - 10-MB internal hard disk drive option
- Comprehensive Software Included:
  - Enhanced CP/M operating system with ZCPR3
  - Word processing, spreadsheet, relational database, spelling checker, and data encrypt/decrypt (T/MAKER III)
  - Operator-friendly shells; Menu, Friendly™
  - Read/write and format dozens of floppy formats (IBM PC-DOS, KAYPRO, OSBORNE, MORROW . . .)
  - Menu-based system customization
- Expandable:
  - Floppy expansion to four drives
  - Hard disk expansion to 60 megabytes
  - SCSI/PLUS™ multi-master I/O expansion bus

T/MAKER III is a trademark of T/Maker Company
IBM is a registered trademark of International Business Machines
Z80A is a registered trademark of Zilog, Inc.
CP/M is a registered trademark of Digital Research

AMPRO COMPUTERS, INCORPORATED
67 East Evelyn Ave. • Mountain View, CA 94041 • (415) 962-0230 • TELEX 4940302

Circle **no. 158** on reader service card.

Release 2.0

C-INDEX™

Variable Length Record Management For C

C-INDEX is a state-of-the-art data management function library for C programmers. Ideal for all data and text based applications. No other package can give you the performance, capability, and portability of C-INDEX. To make sure you are a satisfied customer, we offer a 30 day money-back guarantee. Ask us about it.

- variable length data storage with B+Tree indexing
- high performance, easy to use
- large and small models, fully transportable source
- IBM PC format: Lattice, Microsoft, C86, others
- Macintosh format: Consulair, Manx, others

C-INDEX/FILE ($99) Object code package.

C-INDEX/PRO ($195) Partial source code, no royalties.

C-INDEX/PLUS ($395) Complete transportable source code, no royalties.

Trio Systems
2210 Wilshire Blvd., Suite 289
Santa Monica, CA 90403
213/394-0796

Circle **no. 150** on reader service card.

Apple to find the solutions to these problems.

We have used the driver with and without a cache with some interesting results. For small cache sizes the overhead of maintaining the cache slows the overall operation down. For the Aztec C environment the minimum size is roughly the sum of all the programs, libraries, and include files in use—it is easier to start up the RAM disk and copy everything to it. For large cache sizes it is a pain to run large programs or the switcher because you need to restart the driver with a smaller cache size. The overall conclusion for our working environment is that, although the cache can create RAM-disk speeds, it sometimes creates floppy speeds. The MacSCSI hard disk is nearly as fast as the RAM disk anyway, and maintaining the cache just becomes a headache when switching environments.

Another minor annoyance is that you can't remount the MacSCSI volume if you eject it from an open box—never do so. We are working on adding the code to trap the ejects and ignore them. The eject solution, multiple volumes via partitions, and other improvements will be available in our 2.0 software release within a few weeks.

We are collecting changes for other controller-and-drive combinations to be available on our update disk. If you would like to share your changes, send us a disk with your modifications and we will return it with the current updates. Mail your changes to Fastime, P.O. Box 12508, San Luis Obispo, CA 93406.

DDJ

Reader Ballot
Vote for your favorite feature/article.
Circle Reader Service **No. 198.**

Thinking of the C Language?

THINK COMPUTER INNOVATIONS

NEW!!

C86 VERSION 2.3 with Source Level Debugging Support

The C language has rapidly become the development language of choice for applications ranging from Operating Systems to Accounting Packages. WHY? Its structured approach and extreme portability make it perfectly suited to today's fast-paced environment.

Of all of the C Compilers available for PC/MSDOS, more programmers choose COMPUTER INNOVATIONS' C86. WHY? Because it's part of a COMPREHENSIVE family of C products with an unparalleled reputation for performance, reliability, and stability.

C86 2.3 C COMPILER

C for PC/MSDOS began with C86 and today it remains perhaps the most solid, stable C Compiler available. Even competitor's ads show C86 as a consistent top level performer in benchmark testing.

Version 2.3 offers a host of new features including source level debugging support and a 40% boost in compilation speed. Call for complete specifications.

COST: $395 UPDATE TO 2.3: $35 w/old diskettes NOT COPY PROTECTED
CALL ABOUT VOLUME DISCOUNTS

LEARN C INTERACTIVELY WITH INTRODUCING C

Intimidated by rumors about the difficulty of learning C? Need to train your staff quickly? INTRODUCING C can help. INTRODUCING C combines a thorough, self-paced manual with a unique C interpreter to provide a fast, efficient method of learning C. Designed for both professional and casual programmers, it provides a comprehensive understanding of important C concepts such as standard K&R syntax and operators, full structures and unions, arrays, pointers, and data types. Requires IBM PC, XT, or AT with one disk drive and 192K bytes of memory.

COST: $125 - NOT COPY PROTECTED

CI PROBE SOURCE DEBUGGER

Take advantage of C86 2.3 source level debugging support with CI PROBE. Cut down program development time and save money! CI PROBE is highly economical yet has the features of debuggers costing far more.

COST: $225 - NOT COPY PROTECTED

C-TERP C86 COMPATIBLE INTERPRETER

The C-TERP INTERPRETER is a full K&R implementation that allows you to write code and execute it immediately without the compile and link steps. Once you have your program running with C-TERP you can compile the code (without alterations) with C86 for fast, efficient executable files. C-TERP requires 256K, 512K is recommended.

COST: C86 version - List Price: $300, Special Computer Innovations Price $250.
Combined C86 & Lattice version - List Price: $400, Special Computer Innovations Price $350.

Start With Us, Stay With Us

Computer Innovations offers a complete range of products that let you enter the C environment and create applications with the most advanced set of development tools available. Unparalleled tech support assures that you're always at the height of productivity.

To order call: 800-921-0169

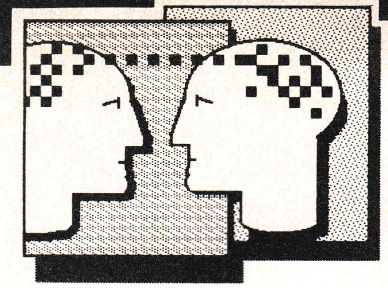
COMPUTER INNOVATIONS, INC.

980 Shrewsbury Ave., Tinton Falls, NJ 07724 • (201) 542-5920

C-TERP is a trademark of Gimple Software. Prices and specifications subject to change without notice.

Circle **no. 96** on reader service card.

CP/M EXCHANGE



by W. E. Wilson

Software running on a Z80-based system under CP/M-80 will frequently perform better than comparable software running on an IBM PC under MS DOS. For example, Microsoft BASIC-86 is actually slower on the IBM PC than BASIC-80 on a Z80-based system. Programs running under CP/M-80 also are frequently smaller than their counterparts on MS DOS. Translate a Z80 assembly-language program into 8086 assembly language and watch the code expand.

Sixteen-bit systems do have a number of advantages over their 8-bit predecessors. You can address more memory and can have better, even color, graphics. The PC can communicate easily with mainframe systems and will probably be more compatible with future developments than the older 8-bit systems. On the other hand, there are still many more software packages available for CP/M than there are for MS DOS, some quite good and very reasonably priced.

When comparing Z80-based systems to the IBM PC, there are some basic facts that you should keep in mind. First of all, the limited addressable memory space of 8-bit systems used to force programmers to write tight, rapidly executing code. With the advent of 16-bit systems and more addressable memory space, software developers were no longer compelled to keep code size small, and they shifted to less efficient programming techniques, including writing in system-independent, high-level languages. Second, most popular 16-bit programs were originally written for 8-bit systems. Developers have often moved these programs to the PC by translating the 8-bit code line by line into the equivalent 16-bit code. The result is that much of the potential efficiency of the 16-bit systems has been lost. For example, many of the spreadsheets that run without any problems on a 64K 8-bit system require more than 128K on a 16-bit system. Third, the memory overhead for the MS DOS operating system is so much greater than the overhead for CP/M-80 that a 128K PC is approximately equivalent to a 64K CP/M-80 system. Finally, the 5¼-inch floppy disk drives on a PC are as slow as molasses in January when compared to the typical 8-inch drives on the older CP/M-80 systems.

W. E. Wilson, Washington State University, Nuclear Radiation Center, Pullman, WA 99164

Mini System Software for a Micro

Back in the days before the invention of the processor on a chip and the development of modern micro systems, memory was very expensive. Minicomputer companies such as Digital Equipment Company provided overlaying linkers for use with their computers. In the early '70's the institution where I worked had a DEC PDP-15 with 64K of memory. DEC provided a software package called Chain and Execute that allowed you to run a very large program on the PDP-15 by segmenting it into a series of overlays. I used Chain and Execute to run some huge programs written in FORTRAN for the IBM 360 on the little DEC system. Not very much is written on the subject of overlays[1], but this technique is used extensively in mainframe systems and in multiuser operating systems.

The Linking Process

The creation of an executable program from a number of source files involves several steps. First, the source files are individually read by the compiler and converted into one or more object modules. Some compilers produce relocatable object code directly. Small-C and its derivatives generate assembly-language output that must be assembled. The following discussion applies to compilers of the latter type only.

It is not practical to have the compiler generate all the code needed for each module. Instead, code is generated only for operations specific to the particular module. General-purpose functions and subroutines from the run-time library are merely referenced by the compiler and only later linked into the program. These external references are "place holders" into which absolute addresses are eventually placed. For functions and variables defined within the module, the compiler generates references relative to the beginning of the module. This means that if the module is eventually loaded at address *L*, then all references will be correct if *L* is added to them.

An assembler then reads each individual module created by the compiler and generates for each one a relocatable object module. This module is called relocatable because it can be relocated anywhere in memory.

The final stage is linking. The linker searches the run-time library for any referenced subroutines and functions. It loads these subroutines and functions along with the relocatable object modules into their final positions in contiguous blocks of memory. Finally, it fills in the absolute addresses for externals and adjusts the relative addresses for internals.

A standard linker builds programs in memory. Thus, the maximum program size is equal to the total memo-

ry space minus the space used by the operating system and the linker. An overlaying linking loader links the program on disk rather than in memory and thus can link a program that will fill the entire available memory space or more. There is, however a penalty paid in speed. An overlaying linking loader must read every file twice—once to locate the globals and determine the size of the module and once to do the actual linking.

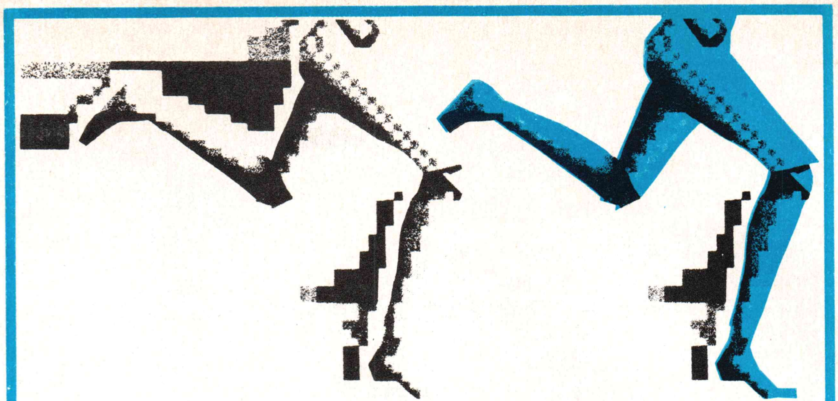
ZLKO

ZLKO from ZEE MICROWARE is an overlaying linking loader for Z80-based systems. The most important feature of ZLKO comes into play when a program is too big to fit into available memory space. The standard solution to this problem is to use the call-next-program technique. This technique involves dividing the program into a selected number of segments, each small enough to fit individually into memory. Each sequential segment except the last must load and execute the next segment. This method is only supported by a few compilers and has a number of disadvantages:

- It is not possible to return to a calling segment
- All segment intercommunication must be via disk files
- Selective segment execution is not possible

All of these weaknesses can be overcome by using the overlaying capabilities of ZLKO.

The user segments the program into a small root (main) module and one or more overlays, each of which is composed of a number of subroutines and functions. The subroutines are grouped into overlays according to criteria selected by the user. ZLKO then constructs a multilevel "tree" of overlays in which the overlays at any given level can call overlays at the next lower level. The execution of the segmented program begins when the root module is executed. The root will then activate other overlays by calling the subroutine "ovrlay" that has been linked with the root segment. The root segment will stay in memory



RUN. EDIT. RUN. EDIT. RUN. COMPILE.

If you're not using a C interpreter, you're not getting the most out of your C compiler.

Stop cursing at your compiler for slow compilation times. Don't blame your compiler. It was designed to produce great executable code. Try *RUN/C Lite*™ instead. *RUN/C Lite* was designed to let you edit, test, and debug program modules interactively, without delay. *RUN/C Lite* and your compiler are a natural combination for fast C program development.

NOW THERE ARE TWO RUN/C'S. ANNOUNCING RUN/C LITE AND RUN/C PROFESSIONAL™!

Thousands of RUN/C™ users were happy with RUN/C just the way it was. But some people (mainly professional programmers) wanted more. So we developed two RUN/C packages. *RUN/C Lite* provides all the standard RUN/C advantages. *RUN/C Professional* adds new and powerful facilities for serious software development.

Now with *RUN/C Professional,* you can dynamically load and unload previously compiled functions, and execute these functions in real-time at compiled speed. Use your favorite libraries (Greenleaf,™ C-Food Smorgasbord,™ Multi-Halo,™ GSS® Graphics, etc.) as part of your RUN/C interpreted code. No need for special configuration, as with some interpreters. (To create new Loadable Libraries™, Lattice® large-model is required.)

DEBUGGING TOOLS

Besides the standard TRON and PRON, *RUN/C Professional* includes an array of new source-code debugging facilities, to test your modules before compiling. TRACE by line ranges. Immediate mode allows you to execute by function. Set multiple breakpoints. Read and/or change the value of a variable and continue with the execution of a program.

FULL-SCREEN EDITOR

A full-screen editor with Wordstar™-like commands is built into RUN/C for program editing convenience.

For immediate delivery or more information, contact:

LIFEBOAT™ ASSOCIATES
1651 Third Avenue
New York, NY 10128
Telex: 424490 (LBSOFT UI)
Telephone: 800-847-7078
212-860-0300 (in New York State)

INTERNATIONAL SALES OFFICES
Italy: Lifeboat Associates, S.p.A., Milan. Phone: (02) 656-841
Japan: Lifeboat Japan, Tokyo. Phone: (03) 293-4711
Scandinavia: Lifeboat Scandinavia. Malmoe, Sweden. Phone (46) 40-10035
England: Grey Matter, Ltd., Asburton, Devon. Phone: (44) 364-53499
Australia: Fagan Microprocessor Associates, Middlepark, Victoria. Phone: (61) 3699-9899

Dealers Welcome   Visa, Mastercard, American Express accepted

Lifeboat, The Source for Software with Full Support, and Lifeboat logo are trademarks of Lifeboat Associates • RUN/C, RUN/C Lite, RUN/C Professional, and Loadable Libraries are trademarks of Age of Reason Co. • Lattice is a registered trademark of and C-Food Smorgasbord is a trademark of Lattice, Inc. • Wordstar is a trademark of MicroPro International Corporation, Inc. • GSS is a registered trademark of Graphic Software Systems, Inc. • Multi-Halo is a trademark of Media Cybernetics • Greenleaf is a trademark of Greenleaf Software •

The Source for Software with Full Support™

© 1985 Lifeboat Associates
ALL RIGHTS RESERVED

LIFEBOAT™

Circle **no. 125** on reader service card.

0100–0102	JP ENTRY
0103–0107	Identification Code
0108–0109	End + 1 of Last Overlay or first free memory location above overlay system
010A–010B	End + 1 of Root Segment or the start of first overlay
010C–0114	Eight Character Root File Name

Byte 0–1	Overlay Transfer Address (Load Address)
Byte 2–3	End + 1 of Segment
Byte 4–11	Eight Character Segment File Name

Figure 1
Root and Overlay Segment Headers

```
            Root (LO)
           /    |    \
       L1A     L1B    L1C
                        \
                         L2A
```

Figure 2
Structure of the test overlay system

```
ROOT(MAIN);OVINIT,OVRLAY,LO;
END;
SYMFIL(CTEST);
OVL(1,L1A);
INCL(L1A);
END;
OVL(1,L1B);
INCL(L1B);
END;
OVL(1,L1C);
INCL(L1C);
END;
OVL(2,L2A);
INCL(L2A);
END;
DONE;
```

Figure 3
ZLKO Command File Used to Create Overlay System

ZLKO Command Summary

CMND	= Take Command Input From Specified File
DCOM	= Display Common Block Information
DMAP	= Display Global and External Symbols
DONE	= Complete Current Segment and Quit
DOVL	= Display Overlay Structure
DSEG	= Display Information On Current Overlay Segment
DUND	= Display Undefined Symbols
END	= Complete Current Segment, forces a SRCH
HELP	= Display Command List
INCL	= Include The Listed REL Files in The Current Segment
OVL	= Build Overlay (.OVL) File
PBSE	= Set Program Code Base Location
QUIT	= Quit and Return to CP/M
RELDMP	= Dump Relocatable (.REL) File
ROOT	= Build ROOT (.COM) File
SRCH	= Search Specified (.REL) Library
STOP	= Quit Building Current Segment and Save The Link Table
SYMFIL	= Generate Symbol File For Symbolic Debugger
?SYM	= Suppress Symbols Starting with ?
TCSW	= Turn Off Module Counting

Figure 4
ZLKO Help Command Output

the entire time. The overlays will be loaded into memory and control passed to each as program execution proceeds. When an overlay returns control to the higher level that activated it, the higher level may then activate another overlay beneath itself or pass control down one level. Each overlay on the same level in the tree is loaded into memory starting at the same location.

Routines in an overlay can reference any symbol defined within that overlay and all global symbols located in any active higher-level overlay up to and including the root segment. Global symbols and routines in the root segment may be referenced from any segment. Frequently needed routines and functions should be included in the root segment. Routines in an overlay cannot, however, reference symbols or routines defined in an overlay on the same level or in a segment lower down the tree.

ZLKO Usage

ZLKO places a 21-byte header on the root-segment file and a 12-byte header on each overlay-segment file (see Figure 1, page 116). The headers include the primary CP/M file name of the segment as well as address information. In the case of an overlay segment, the overlay name and transfer address are used by the ovrlay subroutine to load the overlay. The execution process starts at the root segment and proceeds by descending down and climbing back up each branch of the overlay tree structure one branch at a time.

Using ZLKO with C offers one significant advantage over using it with a language like FORTRAN. FORTRAN employs the call-by-reference technique. Hence, arguments cannot be passed to a called overlay except by means of the COMMON block in the root segment. On the other hand, C uses the call-by-value technique. Thus, values can easily be passed to a function in an overlay. C passes the arguments by pushing them on the stack, and the function in the called overlay simply pops them off the stack.

ZLKO does not automatically insert code into the root segment to set the

stack pointer because the required call to main( ) in the first routine in the root segment will take care of setting the stack pointer. That is, this operation is handled by the C compiler, which expands the call to main to include setting the stack pointer.

Most Small-C compilers use the symbol _memptr to designate the first free memory location above the program code space. The Q/C compiler I used to test ZLKO uses the symbol $MEMRY for compatibility with the L80 linking loader. Under ZLKO, the value to be used for $MEMRY or _memptr is stored in the 8th and 9th bytes of the root-segment header. This value must be extracted from the header and stored in location $MEMRY or _memptr in the compiled C program before program execution commences.

This operation is readily accomplished by using the ovinit function shown in Listing One (page 119). Ovinit must be linked into the root segment and must be the first function called from within main( ). The ovrlay function supplied with ZLKO must be linked into the root segment following ovinit. Each time an overlay is to be loaded, the user program must make a call to the ovrlay function using a pointer to the overlay name as the last argument of the ovrlay function call. The overlay test (see next section) demonstrates the use of the ovrlay function. Ovrlay will load the specified overlay at the transfer address specified in the header and then execute the overlay.

ZLKO Test

I tested the ZLKO overlaying linking loader with a simple overlay system written in C. The test program was compiled with the Q/C compiler and assembled with the CWA assembler distributed by The Code Works. The structure of the test overlay system is shown in Figure 2 (page 116) and the command file used to create the overlay system in Figure 3 (page 116). The code for the root segment and each overlay is presented in Listing Two (page 119). Listing Three (page 125) shows the output that ZLKO sent to the console during the test. The linking process took 126 seconds and the resulting overlay system executes in 11 seconds.

Using ZLKO

ZLKO is relatively easy to use once you understand how to pass to ovrlay a pointer to the overlay to be loaded by the root segment. There are, however, a couple of things you should keep in mind. First of all, because the input information required by ZLKO is extensive, the potential for keyboard errors is quite high. This problem can be solved by using a command file instead of direct input. For example, entering the command:

```
ZLKO CMND(CTEST);
```

causes ZLKO to take its input from the command file CTEST.ZLK. Second, you may have trouble getting accustomed to the fact that all commands require a combination of semicolon and carriage return as a terminator. Finally, although the manual adequately describes the proper use of ZLKO, it will not make

Lattice® Products Are Your Best Investment

Lattice Screen Editor (LSE)—Designed as a programmer's editor. LSE is fast, flexible and easy to learn. LSE's multi-window environment provides all the editor functions you need including block moves, pattern searches, and "cut and paste." LSE also offers special features for programmers such as its error tracking mode and three assembly language input modes. You can create macros or customize keystrokes, menu, and prompts to your style and preferences. **$125.00**

Lattice TopView Toolbasket.—Provides more than seventy C functions for creating programs to take advantage of the IBM TopView environment. Speed TopView-specific program development with window, cursor, pointer, and printer control functions. Expedite program development with the debugging utilities included. **$250.00**

LMK™—Automated product generation utility for MS-DOS, similar to UNIX "Make." **$195.00**

C-Sprite™—Symbolic debugger for programs written in Lattice C or assembly language. **$175.00**

C Compilers—MS-DOS and PC-DOS—The industry standard. **$500.00**

Panel™—High performance screen design and screen management system. Available for MS-DOS, PC-DOS, and UNIX systems. **$295.00**

dBC II™ or dBC III™—C function libraries supporting indexed files that are compatible with dBASE II® or dBASE III™. **$250.00**

C-Food Smorgasbord™—Includes a BDC decimal arithmetic package, I/O functions, IBM-PC BIOS interface, terminal independence package, plus many other utility functions. **$150.00**

With Lattice products you get *Lattice Service* including telephone support, free updates during the warranty period, notice of new products and enhancements when you register, and a money-back guarantee.

Call us today for further information on these, or our many other C programs, utilities, and tools! Corporate site license agreements are also available.

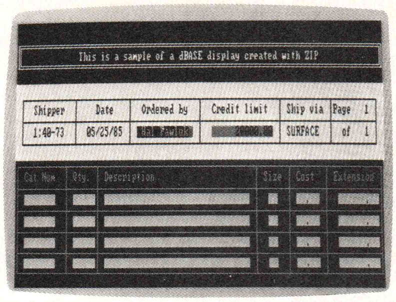
Lattice, Inc.
P.O. Box 3072
Glen Ellyn, IL 60138
Phone (312) 858-7950
TWX 910-291-2190

International Sales Offices

Benelux: De Vooght. Phone (32)-2-720.91.28.
England: Roundhill. Phone: (0672) 54675
Japan: Lifeboat Inc. Phone: (03) 293-4711

Circle no. 101 on reader service card.

dBASE & PASCAL HAVE NEVER LOOKED BETTER.



ZIP™ gives you friendlier, more functional dBASE II/III and Turbo Pascal screens and printed reports quickly and easily.

With ZIP, you just draw your lines and boxes, set colors, type in your prompts and place your fields and variables where you want them, then ZIP writes a routine that is ready to run.

Contact Magnum Data, Inc., 627 S. Plymouth, Los Angeles, CA 90005. (213) 937-0848. And add ZIP to your programs today.

■ Writes fully-accessible source code for an unlimited number of 24 x 80 screens and printed reports up to 88 x 132 in seconds, saves you hours.

■ Supports PICTURE, COLOR and CLEAR in dBASE and Pascal.

■ Supports Pascal character, string, integer, real, Boolean data types.

■ Supports all standard printers: translates graphics to printable characters.

■ DOS 2.0 or higher on IBM PC/XT/AT, Compaq, Corona.

■ $50 ea., $75 for both (US funds). Discounts start at 5 units, licensing available. $3 S & H, plus tax in California.

Call Operator 199 at 1-800-437-5200 (in Maryland, 1-800-638-8890)

MasterCard VISA

Magnum DATA, INC.

dBASE II & III™ Ashton-Tate. Turbo Pascal™ Borland International.
©Magnum Data Inc. 1985

Circle **no. 69** on reader service card.

Scrap your LINKER with FASTER C

Reliably:

CUT Compile times (by 15% to 55%)
CUT Testing times (by 12% to 37%)

HOW: FASTER C keeps the Lattice C or C86 library and any other functions you choose in memory. It manages a jump table to replace the LINKER and immediately execute your functions. You can also CALL active functions interactively to speed your program debugging. It includes many options for configuration and control.

"Automatic" support for new libraries by reading the .OBJ files makes support for new libraries quick and simple.

AVAILABLE FOR PC-DOS, IBM-AT, AND ANY 256K MSDOS SYSTEM.

ONLY $95.
Full Refund if not satisfied during first 30 days.
Call **800-821-2492**

Solution Systems™
335-D Washington St., Norwell, Mass. 02061
617-659-1571

Circle **no. 147** on reader service card.

you an expert at using overlays. All of the commands accepted by ZLKO are shown in Figure 4 (page 116) in the form of a printed copy of the output of the ZLKO Help command. ZLKO is quite verbose and lets you know what is going on at all times. Part of the verbosity is because of the fact that ZLKO displays each component of a command string as it is being parsed.

Conclusion

ZLKO is an easy-to-use, relatively efficient overlaying linking loader that is particularly useful to anyone using a Small-C compiler. ZLKO will allow the user to run very large programs under CP/M-80 and to construct fancy software in which a menu-selection operation determines which overlay (program) is executed next. There are at least two other overlaying linkers available for use with CP/M-80, but they are much more expensive than ZLKO and only provide a few additional capabilities. ZLKO only supports a multiple-file overlay file system, whereas some others also support a single-file overlay file system that uses the random-access capabilities of CP/M-80. A single-file overlay system will execute slightly faster but is more difficult to construct and debug.

Do not discard your older 8-bit system if you can perform the tasks you need to accomplish by simply purchasing an overlaying linking loader such as ZLKO. ZLKO is available from Elliam Associates, 2400 Bessemer St., Woodland Hills, CA 91367.

Notes

[1] A good discussion of overlays is provided by S. H. Kaisler, *The Design of Operating Systems for Small Computer Systems*, John Wiley, 1983.

DDJ

(Listings begin at right)

Reader Ballot
Vote for your favorite feature/article.
Circle Reader Service **No. 199.**

 (Text begins on page 114)

Listing One

```
---------------------------------------------------------------

/* Get addess of first free memory location from ROOT header
and put it in location $MEMRY. This version is for use with the
Q/C compiler.  Change $MEMRY to _memptr for use with small-c */

ovinit()
      {
# asm
        EXT     $MEMRY
        LD      HL,(0108H)      ;Get 1st free mmry addr
        LD      ($MEMRY),HL     ;Put in $MEMRY
# endasm
     }
---------------------------------------------------------------
```

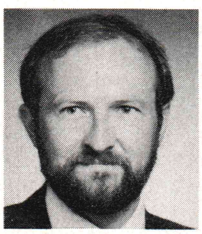
End Listing One

Listing Two

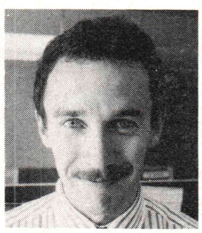
```
------------------------------------------------------------------------

/*  Root program L0.C for testing ZLKO with Q/C */

#include <qstdio.h>

main()
     {
char *ovla, *ovlb, *ovlc;
ovla = "L1A      ";
ovlb = "L1B      ";
ovlc = "L1C      ";
/* initialize Root Segment For Overlays */
      ovinit();
        printf("ZLKO Overlaying Linker Test with Q/C\n\n");
        printf("Starting at level zero\n");
        printf("Call Overlay L1A\n");
```

(Continued on next page)

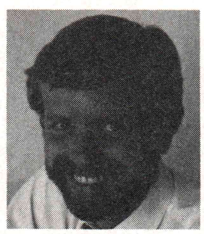
Concurrent™ PC DOS Works For These People



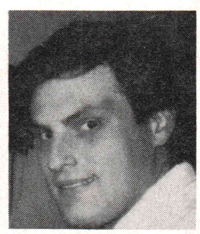
"PhoneXpress™, our voice messaging product, needs the powerful multi-tasking environment that Concurrent PC DOS offers. Also, our programmers love it, they can be compiling in one window and switch into an editor which increases productivity."
Dennis King
Executive Vice President, Founder
Applied Voice Technology



"The file manager is great. It's a step above the old DOS system. You don't have to remember commands and you don't have to read the manual."
John Martinson
Engineer
Pacific Gas Transmission



"Concurrent PC DOS gives us the capability to attach additional terminals for a more productive office. It has a true multi-user capacity. We can now meet deadlines."
Richard Vananda
Principal
Patrick Sullivan Associates, Architects



"I couldn't live without the product. Time is money and the ability to switch consoles and run more than one program has been a great time saver."
Joe Capp
Project Engineer
Union Carbide

"We have created a menu driven system that is totally transparent to our customers. By utilizing the menu system and 4 consoles concurrently we are able to fully utilize Concurrent PC DOS"
Subhash Chadha
MIS Director
Secoin Inc.

Make It Work For You!

Call (800) 443-4200 for the dealer or sales representative nearest you.

Concurrent PC DOS is a trademark and Digital Research is a registered trademark of Digital Research Inc. PhoneXpress is a trademark of Applied Voice Technology.

DIGITAL RESEARCH®
We make computers work.℠

Circle no. **163** on reader service card.

Listing Two

```
 /* Load Overlay L1A */
         ovrlay(&ovla);          /* Pass pointer to ovlname */
           printf("Returned to Level zero from Level one pgm L1A\n");
           printf("Next Call Overlay L1B\n");
 /* Load Overlay L1B */
        ovrlay(&ovlb);           /* Pass pointer to ovlname */
          printf("Returned to Level zero from Level one pgm L1B\n");
          printf("Next Call Overlay L1C\n");
/* Load Overlay L1C */
       ovrlay(&ovlc);            /* Pass pointer to ovlname */
         printf("Returned to level zero, Overlay Test Done\n");
       }
--------------------------------------------------------------------------

/* overlay L1A */
levella()
        {
        printf("At Level one, Overlay L1A\n");
        }

--------------------------------------------------------------------------

/* overlay L1B */
levellb()
        {
        printf("At Level one, Overlay L1B\n");
        }
--------------------------------------------------------------------------

/* overlay L1C */
levellc()
        {
```

(Continued on page 123)

You Read Dr. Dobb's Journal And You Don't Subscribe?!

Save over $23.00 off newsstand prices for 2 yrs.
Save over $10.00 for 1 yr.

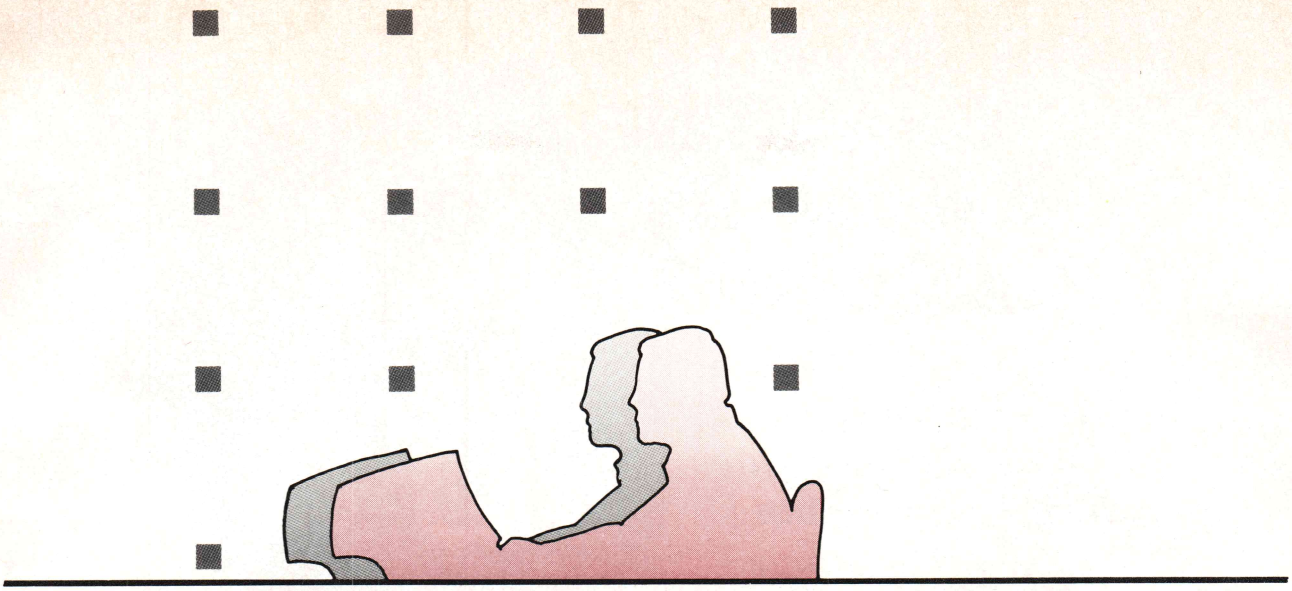
Can you afford to miss an issue with information vital to your interests? As a subscriber you can look forward to articles on Small-C, FORTH, CP/M, S-100, Compiler optimization, Concurrent Programming and more, delivered right to your door. And you'll never miss the issue that covers your project.

Yes! Sign me up for
____ 2 yrs. $47 ____ 1 yr. $25

____ I enclose a check/money order
____ Charge my Visa, MasterCard, American Express
____ Please bill me later

Name ____________________
Address ____________________
____
____________________ Zip ________
Credit Card ____________ Exp. date ____________
Account No. ____________________
Signature ____________________

Please allow 6–9 weeks for delivery. 3048



THE International UNIX* Event of the Year!

February 4-7, 1986 / Anaheim Convention Center / Anaheim, California

UniForum 1986, the International Conference of UNIX Users, has established itself as THE premier UNIX conference/trade show.

■ Over 200 major vendors exhibiting their newest UNIX-based hardware, software, systems, services and peripherals.

■ A complete tutorial and conference program. Multiple sessions target the connectivity of UNIX between the user and technical environments; the hardware and software technology for office systems and workstations; the interface between man and machine, machine and machine, and much more. Day-long tutorials provide intensive, focused material on specific subjects in UNIX...while the conference sessions highlight the latest developments in the continuing evolution of UNIX.

*UNIX is a trademark of AT&T Bell Laboratories.

■ **FREE** UNIX Introductory Workshops.

■ Birds-of-a-Feather impromptu sessions.

Call us NOW for your **FREE** Show-Only Badge *and* complete registration information on the dynamic conference/tutorial program.

The power and potential of UNIX are important to you. UniForum 1986 is THE computer event you can't afford to miss!

UniForum™
The International Conference of UNIX Users

For Complete Information, Call:

800-323-5155

(In Illinois, Call: 312-299-3131)

Or Write:

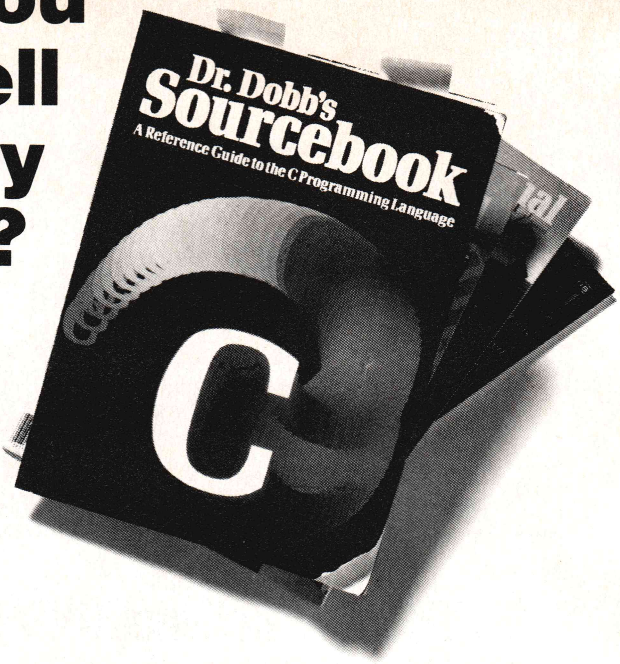
UniForum
2400 East Devon Avenue
Suite 205
Des Plaines, IL 60018

Sponsored by

/usr/group
The International Network of UNIX Users

Circle **no. 120** on reader service card.

Who Says You Can't Tell A Book By Its Cover?



Dr. Dobb's Sourcebook: A Reference Guide for the C Programming Language

For years, serious programmers have relied on Dr. Dobb's Journal for the technical tools of their trade. Now, Dr. Dobb's presents the definitive programmers guide to the who, what, where, when and why of C, the leading language among software developers. This comprehensive guide to new information, products and services specific to C will be your most often-used reference!

In this valuable guide you'll find:

- An extensive directory of hardware and software services—including classes and seminars, C programming opportunities, and on-line services
- A bibliography with over 300 listings of available articles and books on C
- A comprehensive C product listing—including C compilers, graphics modules, utilities, editors and development systems, and more!
- And much more practical C programming information

At only $7.95, no C programmer can afford to be without this unique reference.

To order by credit card, call toll free: 1-800-528-6050 ext.4001 . Ask for item 004 or mail this coupon, along with payment to **Dr. Dobb's Journal, 2464 Embarcadero Way, Palo Alto, CA 94303**

PAYMENT MUST ACCOMPANY YOUR ORDER

_____ I enclose check/money order

_____ Please charge my ___VISA ___M/C ___ American Express

Card #________________________ Exp. Date _____

Signature ________________________

Name ________________________

Address ________________________

City ________________ State ______ Zip ______

Please allow 6 to 12 weeks for delivery

Please send me ______ copies of **Dr. Dobb's Sourcebook**

at $7.95 each = ____________

+ Shipping & Handling = ____________

(Must be included with order. Please add $1.50 per book in U.S. $3.25 each surface mail outside U.S. Foreign airmail rates available on request.)

TOTAL = ____________

3110B

Listing Two

```
char *ovld;
int value1, value2, sum;
ovld = "L2A      ";
        printf("At Level one, Overlay L1C\n");
        printf("Call Level two, Overlay L2A 5 times\n");
        /* Load Overlay 2A */
          value1 = 0, value2 =9;
          while (++value1 < 6)
        { ++value2;
  printf("At Level one Calling L2A, value1 = %d, value2 =
%d\n",value1,value2);
        /* The pointer to the overlay name must be the last parameter */
        /* The ZLKO "ovrlay" routine uses the value in the HL register- */
        /* -to find the overlay name but does not alter the stack */
        /* The called routine must have a dummy last parameter */
          ovrlay(value1,value2,&ovld); }
          /* Pass values and pointer to ovlname */
        }
int sum;
retval(sum)
        {
        printf("Back at Level one, Returned sum value1 + value2 =%d\n\n",sum);
        }

-----------------------------------------------------------------------------

/* overlay L2A */
level2a(arg1,arg2,arg3)
        /* arg1 is value1, arg2 is value2, and arg3 is ovlname pointer */
        /* dummy arg3 is required to match ovrlay function call in L1C */
int arg1, arg2, arg3;
        {
        printf("At Level two, Overlay L2A\n");
        printf("Received parameter value1 =%d, value2 =%d\n",arg1,arg2);
/* Pass sum arg1 + arg2 back to level one*/
        retval(arg1 + arg2);
        }
```

End Listing Two

(Listing Three begins on page 125)

PIK'r

Convert Mainframe Reports to LOTUS Formats Without Re-keying

- The data editor that links mainframe reports to micro spreadsheets.
- Move selected report data directly to the spreadsheet; reformat, edit, rearrange data—no re-keying! Text and numbers!
- Accepts any ASCII file, supports all major spreadsheets, databases, word processors (Lotus, dBASE, Multiplan, Visicalc)

and Introducing MACROPIK'r

Combines All the Benefits of PIK'r Plus:

- A macro facility—save and replay entire sessions with a single keystroke.
- An unlimited page size—works with reports of any size.

Both PIK'r and MacroPIK'r offer mouse support, work with IBM-PC and compatibles, any mainframe. Customer HOTLINE, tutorials and user manual included.

PIK'r—$95 **MacroPIK'r**—$249

SAMKHYA/ CORPORATION
47 Sixth St., Suite 3000
P.O. Box 142
Petaluma, CA 94953
(707) 763-2800

Toll Free
(800) 442-0012 US
(800) 442-5544 CA

Circle **no. 171** on reader service card.

COHERENT for the AT

At last — a UNIX compatible O/S with elaborate hard disk recovery routines!

- COHERENT is the best UNIX compatible O/S for networking, process control and multiuser applications with highly efficient code generation, configurable kernel and flexible disk partitioning.
- Support available for high resolution graphics, image capture, mouse and other hardware.
- A complete COHERENT development environment that includes a screen editor and source code control system.
- Total object code compatibility between the IBM AT, XT, and PC.
- Available with UNIX System V compatible support for interprocess communication enhancements and high speed multiline communication cards (up to 38.4 Kbaud).
- Can be easily programmed into a turnkey environment. Flexible turnkey and runtime licensing available.
- Professional technical support provided.

To discuss your system requirements call: **(604) 294-6201**

INETCO Systems Ltd.
2457 Beta Ave., Burnaby, B.C., Canada V5C 5N1

COHERENT is a trademark of Mark Williams Co. UNIX is a trademark of Bell Laboratories. IBM AT, XT and PC are trademarks of International Business Machines Corp.

Circle **no. 166** on reader service card.

CONTINUING THE TRADITION

DR. DOBB'S JOURNAL ANNOUNCES THE RELEASE OF BOUND VOLUME 8

Every 1983 issue together in one source

BOUND VOLUME 8 (Item #020)
DDJ turns pro. Some of the most powerful, professional programmer's tools ever published in a magazine are in this volume. Jim Hendrix's Small C compiler. Ed Ream's RED screen editor. A microcomputer subset of the Defense Department's official programming language, Ada. C and Forth and 68000 software. Because the magazine increased in size in 1983, this volume is bigger and better that ever.

Vol. 1 1976 (Item #013)
The material brought together in this volume chronicles the development in 1976 of Tiny BASIC as an alternative to the "finger blistering," front-panel, machine-language programming which was then the only way to do things. This is always pertinent for the bit crunching and byte saving, language design theory, home-brew computer construction and the technical history of personal computing.
Topics include: Tiny BASIC, the (very) first word on CP/M, Speech Synthesis, Floating Point Routines, Timer Routines, Building an IMSAI, and more.

Vol. 2 1977 (Item #014)
1977 found DDJ still on the forefront. These issues offer refinements of Tiny BASIC, plus then state-of-the-art utilities, the advent of PILOT for microcomputers and a great deal of material centering around the Intel 6080, including a complete operating system. Products just becoming available for reviews were the H-8, KIM-1, MITS BASIC, Poly Basic, and NIBL.
Articles are about Lawrence Livermoore Lab's BASIC, Alpha Micro, String Handling, Cyphers, High Speed Interaction, I/O, Tiny Pilot & Turtle Graphics, many utilities, and even more.

Vol. 3 1978 (Item #015)
The microcomputer industry entered into its adolescence in 1978. This volume brings together the issues which began dealing with the 6502, with mass-market machines and languages to match. The authors began speaking more in terms of technique, rather than of specific implementations; because of this, they were able to continue laying the groundwork industry would follow. These articles relate very closely to what is generally available today.
Languages covered in depth were SAM76, Pilot, Pascal, and Lisp, in addition to RAM Testers, S-100 Bus Standard Proposal, Disassemblers, Editors, and much, much more.

Vol. 4 1979 (Item #016)
This volume heralds a wider interest in telecommunications, in algorithms, and in faster, more powerful utilities and languages, innovation is still present in every page, and more attention is paid to the best ways to use the processors which have proven longevity—primarily the 8080IZ80, 6502, and 6800. The subject matter is invaluable both as a learning tool and as a frequent source of reference.
Main subjects include: Programming Problems/Solutions, Pascal, Information Network Proposal, Floating Point Arithmetic, 8-bit to 16-bit Conversion, Psuedo-random Sequences, and Interfacing a Micro to a Mainframe—more than ever!

Vol. 5 1980 (Item #017)
All the ground-breaking issues from 1980 in one volume! Systems software reached a new level with the advent of CP/M, chronicled herein by Gary Kildall and others (DDJ's all-CP/M issue sold out within weeks of publication). Software portability became a subject of greater import, and DDJ published Ron Cain's immediately famous Small-C compiler—reprinted here in full.
Contents include: The Evolution of CP/M, a CP/M-Flavored C Interpreter, Ron Cain's C Compiler for the 8080. Further with Tiny BASIC, a Syntax-Oriented Compiler Writing Language, CP/M to UCSD Pascal File Conversion, Run-time Library for the Small-C Compiler and, as always, even more!

Vol. 6 1981 (Item #018)
1981 saw our first all-FORTH issue (now sold out), along with continuing coverage of CP/M, small-C, telecommunications, and new languages. Dave Cortesi opened "Dr. Dobb's Clinic" in 1981, beginning one of the magazine's most popular features.
Highlights: Information on PCNET, the Conference Tree, and The Electric Phone Book, writing your own compiler, a systems programming language, and Tiny BASIC for the 6809.

Vol. 7 1982 (Item #019)
In 1982 we introduced several significant pieces of software, including the RED text editor and the Runic extensible compiler, and we continue to publish utility programs and useful algorithms. Two new columns, The CP/M Exchange and The 16-Bit Software Toolbox, were launched, and we devoted special issues to FORTH and telecommunications. Resident Intern Dave Cortesi supplied a year of "Clinic" columns while delivering his famous review of JRT Pascal and writing the first serious technical comparison of CP/M-86 and MSDOS. This was also the year we began looking forward to today's generation of microprocessors and operating systems, publishing software for the Motorola 68000 and the Zilog Z8000 as well as Unix code. And in December, we looked beyond, in the provocative essay, "Fifth-generation Computers."

Complete your reference library. Buy the entire set of Dr. Dobb's Journals from 1976 through 1983, Bound Volumes 1–8, for $195.00. That's $34.00 off the combined individual prices—a savings of almost 15%!

To order by credit card, call toll free: 1-800-528-6050 ext. 4001. Refer to the item number of each volume. Or mail this coupon to: *Dr. Dobb's Journal, 2464 Embarcadero Way, Palo Alto, CA 94303.*

YES! ☐ Please send me the following Volumes of **Dr. Dobb's Journal.**
Payment must accompany your order.
Please charge my: ☐ Visa ☐ MasterCard ☐ American Express
I enclose ☐ Check/money order

Card # ________ Expiration Date ________
Signature ________
Name ________ Address ________
(please, no P.O. Boxes)
City ________ State ____ Zip ________

Mail to Dr. Dobb's Journal, 2464 Embarcadero Way, Palo Alto, CA 94303

Allow 6–9 weeks for delivery.

Vol. 1	________	x $27.75 =	________
Vol. 2	________	x $27.75 =	________
Vol. 3	________	x $27.75 =	________
Vol. 4	________	x $27.75 =	________
Vol. 5	________	x $27.75 =	________
Vol. 6	________	x $27.75 =	________
Vol. 7	________	x $30.75 =	________
Vol. 8	________	x $31.75 =	________
All 8	________	x $195.00 =	________

Sub-total $ ________
California residents add applicable sales tax____% ________

Postage & Handling Must be Included with order.
Please add $1.75 per book in U.S. ($4.25 each surface mail outside U.S. Foreign Airmail rates available on request.)

TOTAL $ ________

3110C

 (Listing continued, text begins on page 114)

Listing Three

```
        OUTPUT FROM ZLKO TO CONSOLE DURING TEST OVERLAY CONSTRUCTION

->CMND(CTEST);
  CMND(
  CTEST)<--Command File Input
  ROOT(
  MAIN)
  ;
  OVINIT,<--Implied Include List
  OVRLAY,
  LØ;
  END;<--Searching For Required Modules

-- Building File on Disk --

Loading      (Ø:OVINIT .REL)
Loading      (Ø:OVRLAY  .REL)
Loading      (Ø:LØ      .REL)
Loading from(Ø:CRUNLIB .REL)

  -- Filename --                 -- File Information --
  Ø:MAIN    .COM       P.Base: Ø1ØØ    P.Size: ØEA7    Seg.End+1: 1182
                       D.Base: ØFBB    D.Size: Ø1C7
                       C.Base: 1182    C.Size: ØØØØ

  SYMFIL(
  CTEST)<--Creating Symbol File
  ;
  OVL(
  1,
  L1A)
  ;
  INCL(
  L1A)
```

(Continued on next page)

Now available with 8087 Support!

MTBASIC

Basic Compiler

Features:

Multi-line functions	Multitasking
No runtime fee	Windowing
Handles interrupts	Interactive
Fast native code	Compiles in seconds

MTBASIC is easy to use since you can write programs in an interactive environment and then compile them using only one command. MTBASIC has many advanced features like multitasking, random file access, formatted I/O, assembly language calls, and ROMable code.

The MTBASIC package includes all the necessary software to run in interpreter or compiler mode, an installation program (so *any* system can use windows), demonstration programs, and a comprehensive manual.

Ordering

MTBASIC is available for CP/M, MS-DOS, and PC-DOS systems for $49.95. MTBASIC with 8087 support is available for MS-DOS for $79.95. Shipping is $3.50 ($10.00 overseas). MD residents add 5% sales tax. MC, Visa, checks and COD accepted.

SOFTAID, Inc.

P.O. Box 2412 Columbia, MD 21045-1412
301/792-8096

Circle **no. 88** on reader service card.

A Professional Quality Z80/8080/8085 Disassembler

WHEN YOU NEED SOURCE FOR YOUR CODE you need REVAS 3

REVAS interactively helps you:

- Analyse your software for modification
- disassemble files as large as 64K
- Assign Real labels in the disassembly
- Insert COMMENTS in the disassembly
- Generate a Cross Reference (XREF) listing

A 60 page manual shows how the powerful **REVAS** command set gives you instant control over I/O to files, printer, or console; how to do a disassembly; and even how the disassembler works! You get on line help, your choice of assembler mnemonics, control of data interpretation, and calculation in any number base!

REVAS runs in Z80 CPM computers; is available on 8" SSSD (standard), RAINBOW, and other (ask) formats

Price: $90.00 (plus applicable tax), Manual only: $15.00

REVASCO

6032 Chariton Ave., Los Angeles, CA 90056

Voice: (213) 649-3575 Modem: (213) 670-9465

Circle **no. 80** on reader service card.

Listing Three

```
  OLV(
  1,
  L1B)
  ;
  INCL(
  L1B)
  ;
  END;<--Searching For Required Modules
  ;
-- Building File on Disk --

Loading     (Ø:L1B     .REL)
  -- Filename --                       -- File Information --
  Ø:L1B     .OVL        P.Base: 1182    P.Size: ØØØE    Seg.End+1: 11B7
                        D.Base: 119C    D.Size: ØØ1B
                        C.Base: 11B7    C.Size: ØØØØ

  OVL(
  1,
  L1C)
  ;
  INCL(
  L1C)
  ;
  END;<--Searching For Required Modules

-- Building File on Disk --

Loading     (Ø:L1C     .REL)

  -- Filename --                       -- File Information --
  Ø:L1C     .OVL        P.Base: 1182    P.Size: ØØB2    Seg.End+1: 12F5
                        D.Base: 124Ø    D.Size: ØØB5
                        C.Base: 12F5    C.Size: ØØØØ

  OVL(
  2,
  L2A)
  ;
  INCL(
  L2A)
  ;
  END;<--Searching For Required Modules

-- Building File on Disk --

Loading     (Ø:L2A     .REL)

  -- Filename --                       -- File Information --
  Ø:L2A     .OVL        P.Base: 12F5    P.Size: ØØ45    Seg.End+1: 138C
                        D.Base: 1346    D.Size: ØØ46
                        C.Base: 138C    C.Size: ØØØØ

  DOVL;
--- Overlay Structure ---


Name     Number   P.Base   End      Parent
----     ------   ------   ---      ------

L1A      ØØØØ     1182     11B6
L1B      ØØØ1     1182     11B6
L1C      ØØØ2     1182     12F4
L2A      ØØØ3     12F5     138B     L1C

DONE;
No Segment Under Construction

---------------------------------------------------------------------------
```

End Listings

WHO WOULD DIG THROUGH 300 DISKS OF MSDOS SOFTWARE TO FILL 14 DISKS FULL OF GEMS?

$12.00 STOCKING STUFFERS YOU'LL USE ALL YEAR!

DISK MS-1 ESSENTIAL UTILITIES

SWEEP is a powerful replacement for COPY. LU86403 makes (and unmakes) library files from your programs. (Bulletin boards contain many library files.) DSKRTN is a fancy disk utility which hides files, recovers files, and lists first sector of an erased file. WHEREIS finds file in subdirectories. SQUEEZE and UNSQUEEZE squeeze and expand files for faster and cheaper modem transfer. Plus WASH and several other file manipulators.

DISK MS-2 ASSEMBLER AND DISASSEMBLER

CHASM is compatible with the IBM macroassembler. ASMGEN is a disassembler whose output is compatible with the IBM macroassembler (works in 64K). MEMBRAIN converts extra RAM into a RAM disk. UNWORDSTAR converts Wordstar files to ASCII and vice versa. FSPOOL is a printer output to file redirector and SDIR is a super directory program. (And more . . .)

DISK MS-3 ADVENTURE

This is the original text-style adventure game that has kept whole throngs of (otherwise) serious programmers glued to their screens. It's ready to run but we also include source in CII and notes about how to expand this adventure (or create your own). Great fun for all computer users.

DISK MS-4 SINGLE USER RBBS

Turn your PC (or compatible) into a bulletin board and get called by the world. Includes source.

DISK MS-5 FILE AND DIRECTORY UTILITIES

UTIL sorts directories, moves files between directories, redefines the keyboard, and views files. Z sorts files. VTYPE is an easier to use TYPE. ST pages backwards or forwards through files. PROTECT AND UNPROTECT prevents accidental (or purposeful) erasure of files or programs. PCWINDOW a resident multi-function routine that handles notepads, timing, ASCII translation etc. Very handy Sidekick-like program.

DISK MS-6 FIG FORTH
(Includes MS-7, FORTH Source)

DISK MS-8 THREE GAMES

CASTLE is a graphic and conversational adventure. TREKRUN is a startrek style game. BOUNCING BABY is a finger exercise that will enthrall a 10-year-old.

DISK MS-9 PASCAL GAMES, PC MUSICIAN, CALCULATOR

This is our educational disk. PC MUSICIAN lets you write songs right on the screen and test them as you go. "I amazed my friends when I sat down at my computer and played . . ." The PASCAL GAMES aren't all that exciting, but the source should give you a good start on creating your own. PROGRAMMER'S CALCULATOR shows you how the stack, memory, and CPU registers work, plus it's highly calculating.

DISK MS-10 MODEM SOFTWARE

If you want to talk to bulletin boards this is your spot. QMODEM is the fanciest of the MODEM7 packages we've seen. It's powerful but easy to use. KERMIT is the standard package for communicating with mainframe (there are versions of KERMIT for nearly all the mainframes).

DISK MS-11 MULTI-USER RBBS 12.3 SYSTEM

Another complete RBBS, this one allows more than one user at a time.

DISK MS-12 SOURCE OF RBBS 12.3 SYSTEM

DISK MS-13 TEXT EDITOR & FORMATTER

ROFF4 is UNIX-like text formatter, PC-Write is one of the most famous of the freeware editors.

DISK MS-14 FORTH 84

For Super Fast Service Call 503-382-5060

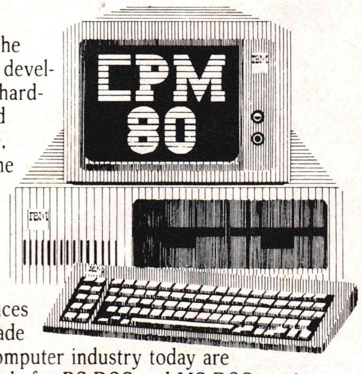
MICRO CORNUCOPIA
The Micro Technical Journal

Disks $12.00 each Postpaid

**MICRO CORNUCOPIA
P.O. BOX 223
BEND, OREGON 97709**

Circle no. 64 on reader service card.

"All you CPM people who wanted to move to IBM, but couldn't... now you can — and bring your CPM software with you!"



From GTEK, the leader in development hardware and software, comes the CPM user's dream.

The majority of advances being made in the computer industry today are being made for PC-DOS and MS-DOS machines.

If you are a CPM user who wanted to convert to these operating systems but didn't because you had to abandon or rewrite your CPM programs, now you can make your move without losing or rewriting a single program!

If you've been using CPM on any of these machines you can now move to PC-DOS or MS-DOS operating systems.

Kaypro • Osborne • Heath/Zenith • Radio Shack • Epson • DEC • IBM • Morrow • Xerox • HP • Sanyo • Intertec • Cromenco • Televideo • Compupro*

The dream from GTEK is a package that makes your PC-DOS (IBM PC, XT, AT) or MS-DOS (IBM clones like COMPAQ, Leading Edge, Televideo) machines think they're being run by an 8080 or Z80 microprocessor with CPM!

The GTEK package contains a CPEmulator™ and CPM Conversion Utility that allows you to read and write popular CPM disk formats such as Kaypro and Osborne.

How easy is it to use? Two steps. (1) Use the Conversion Utility to copy the CPM program to an MS-DOS or PC-DOS diskette. (2) Use the Bind Utility to attach the CPEmulator to your program. And that's it. It's ready to run.

You won't see any difference when you run the CPM program! Now all the work you did in CPM is still valuable when you change to your PC-DOS or MS-DOS machine.

And here's the happy ending to the dream. The CPEmulator is just $199.

Call GTEK's CPM Hotline...
1-601-467-9019

GTEK, INC.

Development Hardware/Software
P.O. Box 289, Waveland, MS 39576
601/467-8048; telex 315-814 (GTEK UD)

*Registered trademarks. GTEK, CPM, PC-DOS, MS-DOS, IBM PC, XT, AT, COMPAQ, Leading Edge, and CPEmulator are also registered trademarks.

Circle **no. 95** on reader service card.

ADVERTISER INDEX

* This advertiser prefers to be contacted directly: see ad for phone number.

Advertising Sales Offices

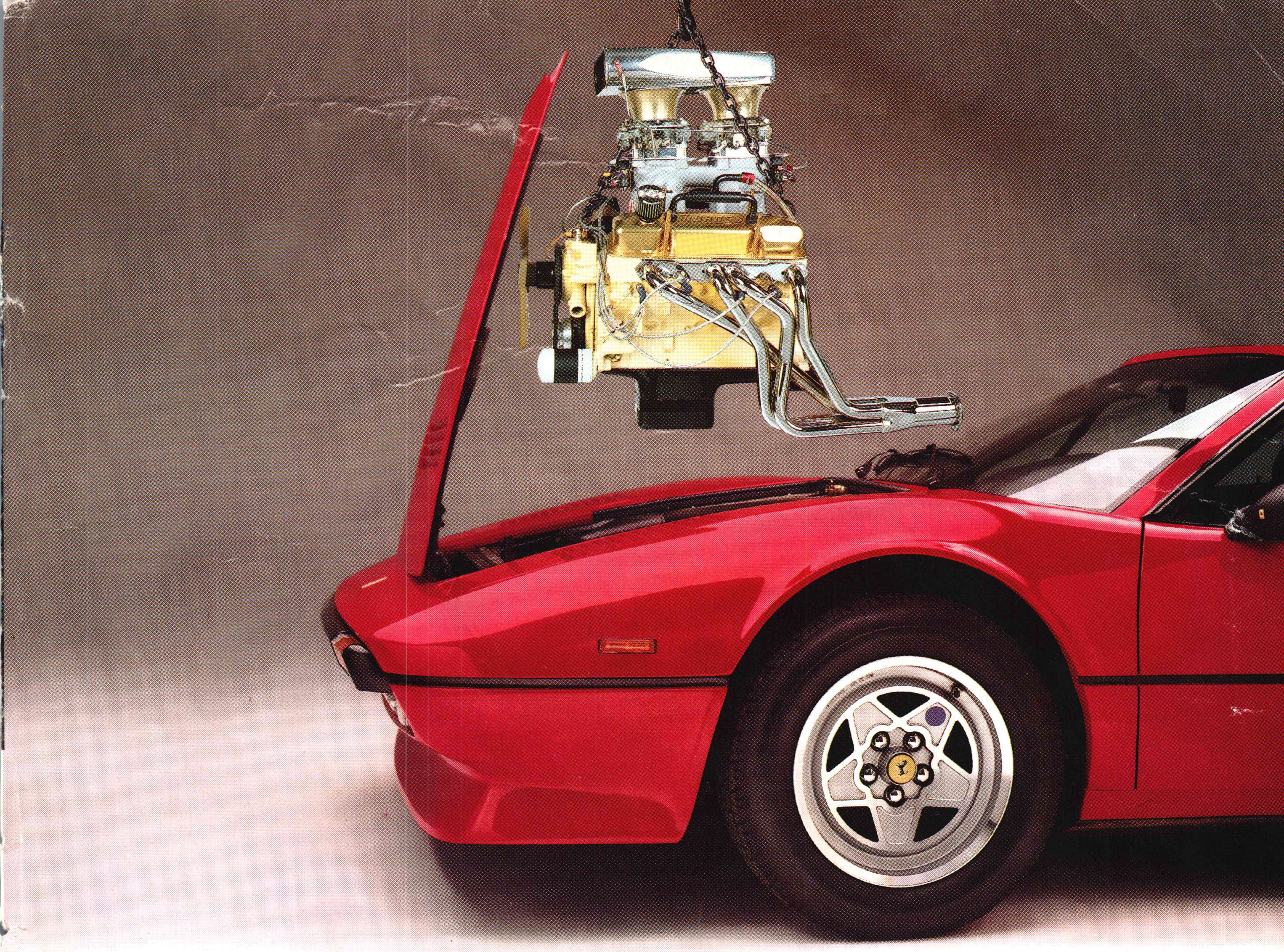
East Coast
Walter Andrzejewski (617) 567-8361

Midwest
Michele Beaty (317) 875-8093

Northern California/Northwest
Lisa Boudreau (415) 424-0600

Southern California/AZ/NM
Beth Dudas (714) 643-9439

Advertising Director
Shawn Horst (415) 424-0600



AT™ Pfantasies for your PC or XT.™

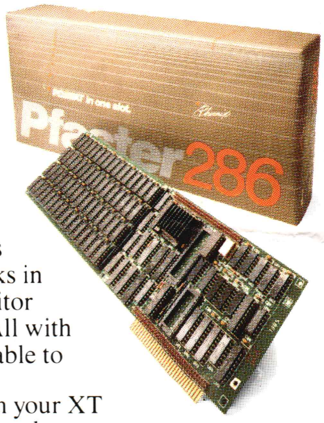
Want better speed and memory on your PC or XT without buying an AT?

You've got it!

Phoenix's new Pfaster™286 co-processor board turns your PC or XT into a high-speed engine 60 percent faster than an AT. Three times faster than an XT. It even supports PCs with third-party hard disks. But that's only the beginning.

You can handle spreadsheets and programs you never thought possible. Set up RAM disks in both 8088 and 80286 memory for linkage editor overlays or super-high-speed disk caching. All with Pfaster286's 1mb of standard RAM, expandable to 2mb, and dual-mode design.

You can develop 8086/186/286 software on your XT faster. Execute 95 percent of the application packages that run on the AT, excluding those that require fancy I/O capabilities your PC or XT hardware just isn't designed to handle. Queue multi-copy, multi-format print jobs for spooling. Or, switch to native 8088 mode to handle hardware-dependent programs and back again without rebooting. All with Pfaster286's compatible ROM software.



And, Pfaster286 does the job unintrusively! No motherboard to exchange. No wires to solder. No chips to pull. Just plug it into a standard card slot, and type the magic word, "PFAST."

If you really didn't want an AT in the first place, just what it could do for you, call or write: Phoenix Computer Products Corp., 320 Norwood Park South, Norwood, MA 02062; (800) 344-7200. In Massachusetts, 617-762-5030.

Programmers' Pfantasies™
by
Phoenix

XT and AT are trademarks of International Business Machines Corporation. Pfaster286 and Programmers' Pfantasies are trademarks of Phoenix Computer Products Corporation.
For the Ferrari aficionado: yes, we know this is a rear engine car. We are showing the addition of a second engine to symbolize how Pfaster can be added to your PC or XT to increase performance.

Circle **no. 91** on reader service card.

SEE US AT FALL COMDEX

SAVE OVER 30% ON OUR GIFT PACKS!
60-DAY MONEY-BACK GUARANTEE

How Borland's Three New Holiday Packs Will Fill Your Stocking Without Emptying Your Piggybank.

Three special packs with dazzling discounts that will help get you into a Holiday mood. You can get some of Turbo, most of Turbo, or all of Turbo—including the two newest members of the Turbo family, Turbo GameWorks™ and Turbo Editor Toolbox™. You also get our unmatched 60-day money-back guarantee, quality products that aren't copy-protected.

TURBO NEW PACK $95.00.

You get the two exciting new members of the Turbo Pascal family,

- TURBO GAMEWORKS, Chess, Bridge, and Go-Moku, complete with source code and a 200-page manual.
- TURBO EDITOR TOOLBOX, all the building blocks to make your own editors and word processors, complete with source code and a 200-page manual.

TURBO HOLIDAY PACK $125.00.

You get all three of the Turbo family classics for only $125.00 (about a 30% discount). Turbo Pascal 3.0 and Turbo Tutor and Turbo DataBase Toolbox—all for just $125.00.

- TURBO PASCAL combines the fastest Pascal compiler with an integrated development environment.
- TURBO TUTOR teaches you step-by-step how to use Turbo Pascal with commented source code for all program examples on diskette.
- TURBO DATABASE TOOLBOX offers three problem-solving modules for your Turbo Pascal programs: Turbo Access, Turbo Sort, and GINST, which generates a ready-to-run installation program that lets you forget about adapting your software to specific terminals.

TURBO HOLIDAY JUMBO PACK $245.00.

This is it—the whole thing, the entire Turbo family including its two newest members. You get:

- Turbo Pascal
- Turbo Graphix Toolbox
- Turbo Tutor
- Turbo DataBase Toolbox
- Turbo GameWorks
- Turbo Editor Toolbox

NEW!

and you pay only $245.00 for all six! Which means that you're getting everything at only about $40 a piece. Quite a holiday deal. (And if you already own one or several members of the Turbo family, be creative—nothing can stop you from buying the Jumbo Pack, picking out the ones you already have and giving the rest as holiday gifts to family and friends. At these prices you can afford to give to others and to yourself.) Speaking of Holidays, this offer lasts until March 31, 1986. (At Borland, we like to make the Holidays last.)

NEW! **TURBO GAMEWORKS $69.95.**

Our new Turbo GameWorks offers games you can play and replay without Turbo Pascal or revise and rewrite with Turbo Pascal 3.0. We give you the source code, the manual, the diskettes and the competitive edge. Chess, Bridge and Go-Moku. State-of-the-art games that let you be player, referee, and rules committee all at once because you have the Turbo Pascal source code. Learn exactly how the games are made—so you can go off and make your own. And Turbo GameWorks is the only quality game you can buy that is not copy-protected. Sold separately, only $69.95. (Just $47.50 if you buy the Turbo New Pack.)

NEW! **TURBO EDITOR TOOLBOX $69.95.**

Build your own word processor—for only $69.95! You get ready-to-compile source code, a full-featured word processor that looks and acts like WordStar™, and a 200-page manual that tells you how to integrate the editor procedures and functions into your programs. With Turbo Editor Toolbox you can have the best of all word processors. You can make WordStar behave like Multi-Mate. Support windows just like Microsoft's Word. And do it as fast as WordPerfect does it. Incorporate your new "hybrids" into your programs to achieve incredible control and power. Sold separately, only $69.95. (If you buy the Turbo New Pack, the price drops to just $47.50.)

NOT COPY-PROTECTED

Holiday Gift Packs, Turbo GameWorks™ & Turbo Editor Toolbox™

Available at better dealers nationwide. Call (800) 556-2283 for the dealer nearest you. To order by Credit Card call (800) 255-8008, CA (800) 742-1133.

The holiday packs include an upgrade coupon for both options so you get BCD and 8087 support for $39.95 (regularly $55.00).

Carefully describe your computer system!

Mine is: — 8-bit — 16-bit
I use: — PC-DOS — MS-DOS
— CP/M-80 — CP/M-86

My computer's name and model is: ____

The disk size I use is: ☐ 3½" ☐ 5¼" ☐ 8"

Name: ____
Shipping Address: ____
City: ____
State: ____ Zip: ____
Telephone: ____ H11

NOTE: Turbo Editor Toolbox and Turbo GameWorks are available for the IBM PC and true-compatibles using Turbo Pascal 3.0 ONLY.

*Gift Pack Offers Last Until March 31, 1986

		Quantity
*Turbo Holiday Jumbo Pack	$245.00	____
*Turbo Holiday Pack	$125.00	____
*Turbo New Pack	$95.00	____
Pascal	$69.95	____
Pascal w/8087	$109.90	____
Pascal w/BCD	$109.90	____
Pascal w/8087 and BCD	$124.95	____
Turbo DataBase	$54.95	____
Turbo Graphix	$54.95	____
Turbo Tutor	$34.95	____
Turbo Editor	$69.95	____
Turbo GameWorks	$69.95	____

These prices include shipping to all U.S. cities. All foreign orders add $10 per product ordered.

Amount: (CA add 6% tax) ____

Payment: VISA MC Check Bank Draft

Credit Card Expiration Date: ____ / ____

Card # ____

COD's and Purchase Orders will not be accepted by Borland International. California residents: add 6% sales tax. Outside USA: add $10 and make payment by bank draft, payable in U.S. dollars drawn on a U.S. bank.

BORLAND INTERNATIONAL

4585 Scotts Valley Drive, Scotts Valley CA 95066
Phone (408) 438-8400 Telex 172373

Copyright 1985 Borland International BI-1017

Turbo Pascal and Turbo Tutor are registered trademarks and Turbo DataBase Toolbox, Turbo Graphix Toolbox, Turbo Editor Toolbox, Turbo GameWorks, and MicroStar are trademarks of Borland International, Inc. WordStar is a trademark of MicroPro International Corp. Multi-Mate is a trademark of Multimate International Corp. Microsoft is a registered trademark and Word is a trademark of Microsoft Corp. WordPerfect is a trademark of Satellite Software International.

Circle no. 161 on reader service card.